digital
146 Main Street
Maynard, Massachusetts 01754

edu

number 8

THIS ISSUE OF EDU IS YOUR LAST ONE.

See renewal notice on Page 2 and subscription renewal form on back cover.

THIS ISSUE OF EDU FEATURES CREATIVITY:
CREATIVE APPLICATIONS, THINGS TO DO, OPINION

THIS ISSUE OF EDU FEATURES CREATIVITY

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PUBLISHER'S STATEMENT

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Wally Roth, Computer Center Director, Taylor University, Upland, Indiana.

Sally Richards Bower, Charles F. Mead, and David H. Ahl, Digital Equipment Corporation.

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CREDITS—PHOTO AND ART

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Millsaps College
Butler High School
Digital Equipment Corporation

THIS ISSUE OF EDU IS YOUR LAST . . .

Unless you fill out and return the questionnaire and renewal form on the back cover of this issue.

EDU and other materials of interest about computers in education are mailed free to interested educators 5 times each school year. However, the mailing list has swelled to over 20,000. Therefore, to continue to receive your complimentary copy of EDU, you MUST fill out and return the attached form.

Even if you returned the form in EDU #7 or at a recent convention, you MUST return the form in this issue for a subscription in the 1973-74 school year. THANK YOU.

FREE EDUCRUNCH

One FREE bar of EduCrunch Candy goes to anyone who writes an acceptable newsy article describing their use of a DIGITAL Educational Computer. Your article should include such information as current uses of the computer, benefits of the system, purchase decision process, and people and organizations employing the system. Good articles may be published by the news media (with the author's name) or included in promotional literature. All articles become the property of Digital. Acceptability of articles is determined solely by Digital judges.

FIVE FREE bars of EduCrunch go to anyone who gives us the name of a friend who buys an EduCrunch System.

TEN FREE bars of EduCrunch goes to anyone who buys an EduCrunch System.

Offer limited by supply of EduCrunch Bars.

WHAT IS CREATIVITY?

Creativity is like going big-game hunting and coming home with a butterfly. Or peeling an orange and finding a bagel inside.

Creativity is like landing on a strange planet and finding mountains made of marshmallow cream. It is looking at one thing and seeing something else; what is tall may become short; what is skinny is suddenly fat; what is big is suddenly small.

Creativity is asking questions about everything, changing things around, adding on, subtracting, reorganizing, making new associations between old things—coming up with new ideas. Creativity is asking, looking, seeking. It is opening oneself up to the world and wondering why.

Joseph Wayman

Reprinted from *Teacher,* March, 1973.

> "What we need is people who can look into their thinking and make value decisions responsible to mankind."
>
> *Father J. Donald Monan*
> *President of Boston College*

EXPLORING CREATIVITY

The creative person is aware of the world in which he lives. He sees the unique and unusual in his everyday surroundings. The more sensory awareness he possesses, the more "signals" he will receive from his environment. The goal in developing this skill within the child involves creating an awareness of the five senses and employing them to their fullest extent. Try some of these activities with your students to help them become more aware of their world.

Blindfold a student and hand him an object—for instance, a hairbrush, a sponge, or a piece of fur. Let him tell the class how the object feels.

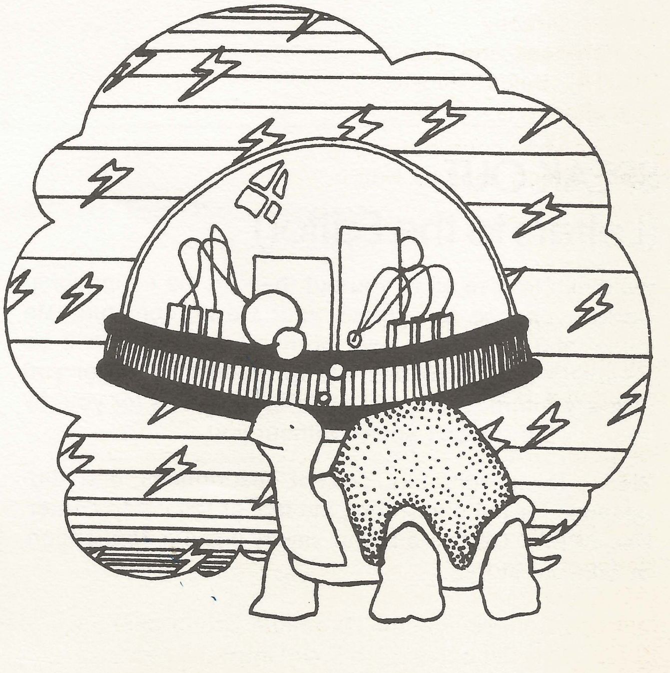
Give students an opportunity to tell or write a short explanation in answer to: "What would happen . . . if you were the teacher, if our arms were three times as long, if the earth was all spongy . . ."

Let students retrace verbally their steps by listing all the things they saw on the way to school.

Ask the students to describe a tree, first in the language of a scientist, secondly as a mathematician and then in the language of an artist. Compare the approaches.

Have students act out the feelings of anger, pain, hunger, fear, joy, and others they may think of that show emotion.

For more suggestions see the *Teacher,* April, 1973, pages 88, 89.



See "turtle" article on Page 35.

SPEAK OUT
(Letters to the Editor)

We'd like to give all of you out there in the educational world a chance to express your views, communicate ideas, and blow your own horns! That's why we'll be reserving a page (or more if we need to) just for *you* in every future issue of EDU. SPEAK OUT is *for* you, *by* you . . . but it won't speak without you.

We'll publish editorials, project descriptions, and suggestions for the classroom, the lab, or the comp center. Use SPEAK OUT to air your views, make a connection, or tell your story.

Educational Products Group (5-5)
Digital Equipment Corp.
Maynard, Mass. 01754

South Portland Computer Project

637 Highland Avenue
South Portland, Maine 04106
March 12, 1973

Editor, EDU
Educational Products Group
Digital Equipment Corporation
Maynard, Massachusetts 01754

Dear David,

Just a note to say that I really enjoyed the latest EDU. I read it from cover to cover and found many good tidbits. Keep it up.

Sincerely,

Ann Waterhouse

Neshannock High School
301 Mitchell Road
New Castle, Pa. 16105

March 9, 1973

Editors of EDU
Educational Products Group
Digital Equipment Corporation
Maynard, Mass. 01754

Dear Sirs:

This past week I received a copy of EDU#7 in the mail. It was my very first copy of EDU—and I can't pass by the opportunity to tell you what a *terrific* magazine I think it is! Already my copy is worn from reading, rereading, sharing with others, and clipping. People are waiting in line to read it. *Please* don't ever take me off your mailing list.

I commend the editors for putting together such a fine magazine. It will certainly help make the computer instruction in our school just "a little bit better"—at the least.

I am anxiously awaiting the arrival of EDU #8.
Much Thanks,

Alice Otto
Math Instructor

P.S. Could you please send me copies of EDU #6, #5, #4, #3, and #2? I'm dying to know what I've been missing.

March 13, 1973

Education Products Group (5-5)
Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts 01754

Gentlemen:

Yes! I would like to surprise my friends by whipping out my genuine, but obsolete, Flip Chip Module from my handy-dandy-Flip-Chip-Module-holder.

I would like 5 (five) of the giant, economy size Flip Chips, which are selling for the drastically reduced price of $1.00 (one dollar) each. This makes a total of $5.00 (five dollars), so far.

But what giant, economy size Flip Chip is complete without the smaller, but still obsolete, 25¢ variety Flip Chip Module? I am adding $1.00 (one dollar) to my previous total for 4 (four) of the smaller Flip Chips. If my elementary school addition does not fail me, I believe that comes to a grand total of:

$6.00.

You had better find my six dollar check in here or the Postal Service is in big trouble.

Please rush the 5 big ones and 4 small ones to me before I *flip* (Ha! Ha!).

Sincerely yours,

Joel Richardson
Rt. 2, Box 1416
Magnolia, Texas 77355

jar
Enclosure: Six dollars of legal tender.

Adlai E. Stevenson High School

District 125, Lake County
Prairie View, Illinois 60069

To Whom it May Concern,

Enclosed you will find three games that can be played on the computer. I am sending them in response to an article which appeared in the EDU #7. . . .

. . . By the way, your publication is the most interesting and informative computer publication we receive. Keep up the good work.

Sincerely yours,

John C. Tieman

California State College, Bakersfield
9001 Stockdale Highway • Bakersfield, California 93309

March 19, 1973

Educational Products Group
Digital Equipment Corp.
Maynard, Mass. 01754

Gentlemen:

In regard to the item in the lower left corner of Page 35 of E.D.U. number 7, I feel that we FORTRAN users should have equal time. I am enclosing a copy of one of our badges we wear.

Dr. John C. Biddle, Director
Institutional Research & ADP

JCB:lf
Encl.

JOIN
STAB
SOCIETY TO ABOLISH BASIC

Saint Patrick High School

5900 West Belmont Avenue
Chicago, Illinois 60634
282-8844
March 19, 1973

Digital Equipment Corporation
146 Main Street
Maynard, Mass. 01754

Dear Sir:

Your edu #7 is the best conglamoration of pertinent computer resource materials I have seen. Looking over my records, I see I have a copy of edu #6 and edu #4 but where are the others?

I sure would like to have a copy of edu #2, edu #3, and edu #5 to complete my set (alas, I'll have to only dream about edu #1, I guess!).

Please send a copy of these issues that I lack. Best of continued luck to you. We all await edu #8, edu #9, etc.

Thanks in advance.

Sincerely,

Kenneth Janowiak

CORRESPONDENCE CORNER

BLACKSBURG HIGH SCHOOL
Blacksburg, Virginia 24060
December 22, 1972

Dr. Alan F. Clifford, Head
Department of Chemistry
Davidson Hall
Virginia Polytechnic Institute & State University
Blacksburg, Virginia 24061

Dear Dr. Clifford:

This is to thank you, Prof. Dessy, and Mr. David Larsen for the one month loan of the Digital Equipment Corporation PDP 8/L mini-computer.

We appreciate very much the opportunity to have this machine available to our students as an integral part of the program in our Business Mathematics classes. By having access to a computer within our classroom we were able to offer students from every ability level and every strata of society a chance to use the computer on an individual basis.

We expected the good academic students to be interested and they were. However, students who had not been interested in anything all year stood in line to use the computer.

The mini-computer was easy to use and as long as we kept it on one floor, easy to move from classroom to classroom.

Sincerely,

Ben Eichelberger
Mathematics Instructor

UNITED NATIONS

INTERNATIONAL SCHOOL

5 February 1973

Mr. David H. Ahl
Manager
Education Products Group
Digital Equipment Corporation
146 Main Street
Maynard, Mass. 01754

Dear Mr. Ahl,

On behalf of the Secretary-General of the United Nations and the Board of Trustees of the United Nations International School, I wish to thank the Education Products Group of DIGITAL Equipment Corporation for the generous gift of an EduSystem 25 educational computer system for the School as outlined in your letter of 23 January 1973. This gift, along with your offer for teacher training, will certainly produce a Digital laboratory of such excellence that will be an outstanding educational model for all schools.

The spirit which has motivated your action is a source of encouragement to those who are engaged in reaching out to the children of every race, creed and culture represented at the School. Through your support, you are helping to forward the principles of international understanding enumerated in the United Nations Charter and in so doing, giving tangible recognition of your faith in the Organzation.

Yours sincerely,

Mrs. Murray Fuhrman
Specal Representative of
the Secretary-General

CLASSIFIEDS

READERS: This is *your* section. We'll run your ad here FREE if you're a school or non-profit organization. Got some older equipment you'd like to sell, a useful software package, or some other service? We'll also run want ads—looking for hardware, software, part-time labor, etc.?

The next issue of EDU is due to appear in early September—get your ad to the Editor, EDU by August 1 to guarantee insertion.

POSITIONS OPEN:

PDP-11 PROGRAMMER
RSTS exp with BA, BS degree essential. FORTRAN or file-handling program'g helpful. Bklyn location. $10K-$14K.

COLL STUDENT SUMMER WORK. PDP-11 RSTS & FORTRAN. Programming. Contact: G. A. Mapp Medgar Evers College 1150 Carroll St. Bklyn, N.Y. 11225.

MEETINGS OF INTEREST

DATE	*CONFERENCE*	*CONTACT*
April 25-28 Houston	National Council of Teachers of Mathematics, 51st Annual Meeting (Educational User Meeting in conjunction with this meeting. Also, Dr. Seymour Papert, M.I.T., will conduct a workshop demonstrating the use of the "turtle" plotter in intermediate mathematics)	NCTM 1201 16th Street, N.W. Washington, D.C. 20036
May 2-5 Philadelphia	DECUS Spring Symposium (Educational User Meeting in conjunction with this conference. Also Dr. Ludwig Braun, Huntington Project, and Mrs. Teresa O. Green, Project DELTA, will lead computer workshops)	DECUS Maynard, MA 01754
June 18-20 Claremont, CA	Fourth Conference on Computers in the Undergraduate Curricula (Educational User Meeting in conjunction with this conference)	Bill Koteff Institute for Educational Computing The Claremont Colleges Claremont, CA 91711

MORE DIGITAL ON THE TUBE AND TRANSISTOR

As we mentioned in EDU #7, DIGITAL EduSystems are catching the eye of the media. As the leader in educational computing, DIGITAL people have been in demand for radio and TV shows lately. In particular:

New Bedford/Boston: WTEV-TV. February 13, 1973. 15-minute interview on the show "Community" with Sally Bower of DIGITAL.

Albuquerque: KGGM-TV. February 12, 1973. 30-minute demonstration/presentation on "FORUM—13" by Sally Bower of DIGITAL.

Tucson: KGUN-TV. February 17, 1973. 10-minute interview on the Jim Furgeson Show with Sally Bower of DIGITAL.

Atlantic City: WMID. February 25, 1973. 2-hour talk show with Alice Peters, Dave Berry, John Roberts of DIGITAL along with Tom Pears of Princeton Day School and John Boyce of Centennial Schools, Warminster, PA.

Philadelphia: WDAS. March 18, 1973. 30-minute interview on the Bob Perkins Show with Sally Bower of DIGITAL.

EDUSYSTEM HANDBOOK

Imagine all these books rolled into one:

"Teach Yourself BASIC" (2-volume self-teaching primer)
EduSystem 5 and 10 User's Guide
EduSystem 15 User's Guide
EduSystem 20 User's Guide
EduSystem 25 User's Guide
EduSystem 30 User's Guide
EduSystem 40 and 45 Addenda
EduSystem 50 (TSS/8) User's Guide
FOCAL Language Guide
FORTRAN (4K) Language Guide
PAL-D Language Guide
EduSystem BASIC Reference Card

Separately, these books would cost $18.75. Wrapped up into one 700-page EduSystem Handbook, it costs just $5. It's a comprehensive book of knowledge on PDP-8-based EduSystems. Get one today! $5; quantity discounts apply.

AS YOU KNOW, DEREK, IT WAS MY IDEA TO TRY COMPUTERIZED SCHEDULING THIS YEAR, AND I WAS WONDERING WHAT YOU THOUGHT OF IT?
© Field Enterprises, Inc., 1973
IT WAS REALLY FANTASTIC!
BATIUK 3-15
I NEVER GOT TO BE IN A GIRL'S GYM CLASS BEFORE!

BRINGING COMPUTERS TO THE PEOPLE

by David H. Ahl

"Computers are for Kids, Not for geniuses." That was DIGITAL's motto shortly after entering the secondary school computing area back in 1965. It is still our motto and our philosophy. In fact, it probably should be extended to include adults as well as kids. Something like, "Computers are for People, Not for Programmers." Never in the history of man has there been a device which provides such a continuing level of self-fulfillment, motivation, and good solid fun.

The real question now is how to extend the challenge and joy of computers to all kids and indeed, to all people. Sure, schools are one way. But perhaps not the best, and certainly not the only way. Here are some other approaches we've run into recently.

Open Storefronts. The Peoples Computer Company in Menlo Park, California (See EDU #7) is a good example. After school and evening hours, a highly informal atmosphere coupled with a rock bottom price ($2/hour) turns this center into a lively, unpredictable place. Mainly kids, mainly running games like Spacewar and Mugwump but also some real learning. Learning the capabilities and limitations of computers and learning to be their friends. We're sure the open storefront concept will spread, maybe even into franchised chains like McDonalds.

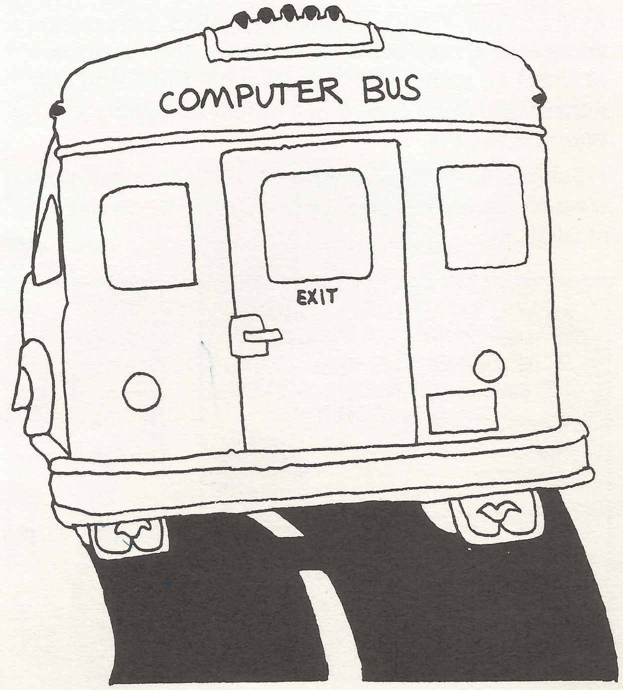
Museums. In the last 30 years, the Chicago Museum of Science and Industry, the Munich Museum, and many others with lots of working displays have been a roaring success. For younger age children (pre-school to early teen) the Boston Children's Museum has set the example; it is a place full of things for youngsters to touch, manipulate, and explore, not just to look at.

Within the last 5 years, some forward thinking museum directors have started to install timesharing terminals and working minicomputers. Notable is the Oregon Museum of Science and Industry whose students, under the direction of Rusty Whitney, have produced a substantial volume of research studies on a formidable array of topics using the timesharing terminal and DIGITAL EduSystem 25 minicomputer at the museum.

Not strictly a museum, but operated similarly, is Lawrence Hall of Science at the University of California, Berkeley. Lawrence Hall is open to students and conducts actual extracurricular "classes" in the use of computers. Lawrence Hall has gone far beyond the traditional terminal and has loads of devices for experimentation (plotters, a turtle that "walks" around tracing its path on brown wrapping paper, music boxes, etc.) They also have one of the most extensive libraries of computer games.

The Boston Children's Museum also has several advanced calculators and two minicomputers, used now mainly for game-playing. Bill Johnson, an independent and successful businessman just recently donated a DIGITAL EduSystem 20 to the Charlotte Nature Museum. And other museums throughout the U.S. are looking for ways to acquire interactive, hands-on computer systems.

Busses and Car Trunks. Museums and storefronts require people to go to the computer; how about bringing the computer to the people? Centennial Schools, Warminster, PA have bolted a DIGITAL PDP-8/S and teletype to the floor of an old school bus that now makes the rounds of the junior high schools in the district. Dubbed the "Computer Bus" the students themselves have painted the bus black and white and largely use the computer in a free-form, learn-as-you-go approach. Incidentally, the high school has no less than 5 DIGITAL PDP-8 family minis on which students can continue their explorations.

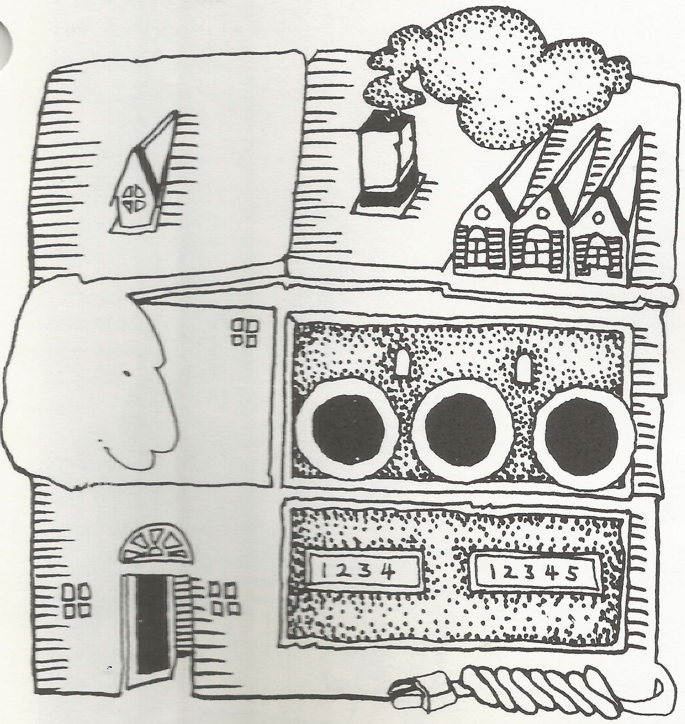


Eddie James, an energetic guy in Seattle, has been carting around a DIGITAL PDP-8/L EduSystem 10 for several years in the trunk of his Opel. Through his efforts, students in four schools have been able to really touch and know a computer on a regular basis rather than reading about it abstractly or going to some distant center to use one.

Across the country in Pulaski, Tennessee, Don Russum has a small company, Darten Computer Technology, mainly to take DIGITAL EduSystem 10 minicomputers around to smaller schools and expose the kids to the beast.

While their efforts have been mainly connected with schools so far, we think the day is coming when some form of mobile computer system will make its appearance in community centers (like Bingo night, there'll be a computer night), union halls and shopping centers.

Homes. A growing number of individuals have been acquiring computers for their homes, and even more have timesharing terminals. Costing less than a yacht or an exotic sports car, a minicomputer serves several real functions in the home. For the kids in the family, it provides the same learning and motivation as does a computer at school—more because it is always accessible. It can also be used for investment analysis, home management, as well as its obvious role as a mind-expanding, super-fun companion.



Are there other approaches to bring computers to the people or vice versa? Probably. If you know of any or have some untried ideas of your own, we'd like to hear about them. Meanwhile, remember: computers build strong minds, computers foster creativity, computers nurture self-fulfillment, but most of all, computers are fun.

A CREATIVE VIEW

By now, practically everyone has seen the cover photo of the earth over the barren landscape of the moon. Reflect for a moment or two on the various ways of viewing this scene. For example, we humans are the passengers on Spaceship Earth as it hurtles through space. Or, earth and our solar system are just one of an infinite number of solar systems, scores of which also support intelligent life, some eons more advanced than we humans.

Here are some facts about the earth to help you view it in a creative way.

World Population	3,635 million
Population Growth	2% per year
Land Area	52,422,000 sq. miles
Diameter	7,913 miles
Moon distance from Earth	238,857 miles

Consider these questions:

1. On average, how many people occupy each square mile of land area? If 95% of the land area is uninhabitable or devoted to cultivation, what is the population density?
2. What will the population be in 2073? In 2973? How about the population density? What kind of problems is this likely to create? The population density of Korea today is 12 times the world average and their growth rate is 2.5% per year. What will be their density, assuming no radical changes, in 2973?
3. A person is roughly 18 inches wide at the shoulders. Standing shoulder to shoulder, how many times around the globe will the world population go? (This, of course, assumes the ability to walk on water.)
4. The average person is 5′4″ tall. If people stood on each other's heads, could we reach the moon? Would anyone be left over? How many? If it took each new person one minute to climb on the people tower, how many days (or years) would it take to get to the moon? Is this a good means of travel?

There was a child went forth every day,
and the first object he look'd upon,
that object he became,
and that object became a part of him
for the day
or a certain part of the day,
or for many years
or stretching cycles of years . . .
—*Walt Whitman*

SIG I—A COMPUTER-BASED AID TO CAREER DECISION-MAKING

Guidance for career decision-making offers an interesting and challenging opportunity to exploit the interactive capabilities of the computer. Each student represents a unique combination of needs, values, interests, abilities, perceptions, preferences, and plans, and thus requires unique treatment. Yet there are regularities in the process of decision-making that can be used to establish a structure within which these unique characteristics operate. Like chess or golf, each player's tactics may be different, but he plays on a given board or course under constraint of certain rules. Every game may vary, but The Game remains the same.

Helping students to make informed and rational career decisions requires what may be called structured flexibility: The computer must be able to respond to the unique needs of each student within a clearly defined context.

A multiple-choice format lends itself particularly well to this requirement. It candidly and explicitly specifies the structure to the student, yet permits him to branch through a multiplicity of pathways within that structure. It instructs him in the rules and possibilities of the decision-making game, while it allows him to play the game for himself, without undue kibitzing.

This format for the dialogue between student and computer is used in a computer-based System of Interactive Guidance and Information (SIGI) now being developed at Educational Testing Service to help community and junior college students in their career decision-making. Work has been supported in large measure by grants from the Carnegie Corporation, with an additional grant recently received from the National Science Foundation.

SIGI runs on a PDP-11 configuration similar to RSTS-11. For more information about SIGI, write directly to ETS. Please mention EDU.

Arthur Kroll
Project SIGI
Educational Testing Service
Princeton, New Jersey 08940

Insect control by chemical pesticides vs. male sterilization is an exciting topic for high school students using a computer model of the insect population.

INTRODUCING RSTS/E

System Description

RSTS/E is a total computer system designed to allow multiple users to interactively process large amounts of data easily and efficiently. RSTS/E stands for "Resource Sharing Timesharing System/Extended." The system is built around the DIGITAL medium-scale PDP-11/40 and PDP-11/45 computers.

Sophisticated and Powerful Hardware

State-of-the-art PDP-11 family architecture combines the systems-level power of stack processing with the proven speed and efficiency of a general register machine. The complex addressing modes of systems data structures are built right into the PDP-11/45 hardware. So too are the multi-priority interrupt handling capabilities that drive the large complement of peripherals at their fully rated speeds.

The no-compromise design philosophy of the PDP-11/45 starts with memory systems that expand to 248K bytes. Bipolar solid-state memories operate at a speed of 300 nanoseconds; core memory at 900 nanoseconds. Processing speed, too, is exceptional with the processor capable of performing 3,000,000 operations per second. Floating point hardware performs arithmetic operations with 17 decimal digits of accuracy, typically in less than 12 microseconds. A memory management system assures efficient use of all available memory while permitting complete protection of programs and data.

High performance RSTS/E System provides capability for comprehensive data management and supports 32 interactive users and a wide range of peripherals.

Many Users, Large Programs

RSTS/E puts the exceptional hardware power of the PDP-11/45 into the hands of the users. RSTS/E provides versatile and rapid system access to 32 users simultaneously with jobs ranging from small "desk calculator" tasks to huge 32K byte programs.

Extensive Data Base Support

The data file system of RSTS/E provides a wide range of on-line processing capabilities. Files may be random or serial, numeric or alphanumeric. Files may be created, updated, extended and deleted interactively from the user's terminal or under program control. Files can be protected from access on an individual, group, or universal basis. Data may be stored on removable disk cartridges, disk packs, or magnetic tape. Industry compatible magnetic tape files prepared on another computer may be read on RSTS/E and files generated on RSTS/E are readable by other computer equipment. Files may be accessed by many terminal users simultaneously and updated on-line.

Efficient User Interaction

Users interact with RSTS/E using BASIC-PLUS. The language is easy to learn and use. The immediate mode of operation enables the terminal to be used as a desk calculator. It also simplifies debugging since programs may be interrupted at any point, checked, corrected, and operation resumed. Also, built into BASIC-PLUS are the means to automatically recover from input/output errors.

Resource Sharing

With the BASIC-PLUS, every terminal user is able to use all system peripherals and resources. Line printer, card reader, disks, tapes—all are available to any terminal user on-line. Enhancing the use of these resources is the ability to provide output in the most meaningful format for the recipient.

Operational Efficiency

RSTS/E installations can expect exceptional efficiency of operation because the operating system continuously and dynamically allocates processor time, memory space, file space and peripherals on a best-fit/best-throughput basis. Efficiency results too from the system manager and users having on-line access in BASIC-PLUS to 34 system management commands and operations, many of which are normally manual.

Comprehensive Security

The ability for total or selective backup of programs and files is provided in RSTS/E. Backup may be done on-line without disrupting system users or it may be done off-line. In the unlikely event of a system crash, power brownout or other malfunction, the basic system will automatically recover while all programs and data files are maintained intact and generally may be easily restarted from the point of failure.

Digital Equipment Corporation

Digital is the world's largest and most experienced manufacturer of small computer systems with over 22,500 computers installed and in use. Over 3,000 installations are of PDP-11 family systems.

In 1963, Digital began work on the PDP-6 timesharing system, the first timesharing system to be delivered with manufacturer supported software. The follow-on 128-user DECsystem-10 is one of the most sophisticated, highly developed timesharing systems in the world with well over 200 installations. In 1968, Digital introduced Timeshared-8, a versatile 16-user timesharing system based on the popular PDP-8 computer.

RSTS-11, forerunner to RSTS/E, was introduced in June 1971. Over 150 RSTS-11 systems are installed today performing such jobs as on-line order entry, production control, accounts receivable and payable, inventory management, and invoicing. Schools and colleges use RSTS for on-line student registration and school management as well as for research, simulations, algorithmic problem solving and computer assisted instruction.

RSTS/E—The Total System

RSTS/E is surprisingly economical. Complete systems range in cost from $85,000 to $200,000. Lease costs, including maintenance, range from $2,400 to $5,600 per month.

RSTS/E. Unparalleled performance. Complete data management. Easy to use. Highly efficient. Proven capability. The complete computer system from the complete computer company.

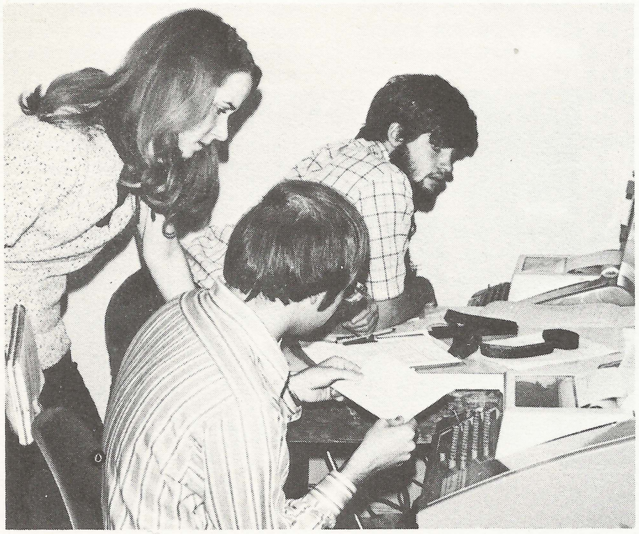
For more information, contact your local DIGITAL office, or write for the RSTS/E brochure.

MILLSAPS GETS NEW SCIENCE TEACHER

"Millsaps College, Jackson, Mississippi has a new science teacher ten and a half inches tall. . . . *no*— it's a PDP-8/E computer." So stated Paul Harvey in a recent newscast.

Since its installation in November 1971, the 8/E has registered over 2700 "log-ins" by students and faculty using the system for a variety of purposes all the way from quick arithmetic to research projects. The 8/E is undoubtedly the most used piece of academic equipment on campus and is used by students in biology, chemistry, computer science, economics, geology, mathematics, physics, political science, psychology, and sociology.

The 8/E has had a significant impact on curriculum at Millsaps. To cite but two examples, beginning students in chemistry get an introduction to BASIC as part of their laboratory instruction so that they can use the computer to aid in laboratory calculations and data reduction. A summer course—Mathematics and the Computer—was initiated to give high school students an opportunity to see how the computer can be a partner in mathematics. With each new semester, use of the computer is increasing and 8/E is helping new faces in new courses.



Dr. Allen Bishop in chemistry and Dr. Robert Shive in mathematics have actively pursued use of the computer as an instructional tool in local secondary education. One local high school is using Millsaps 8/E via a remote terminal and plans are being completed to add others. Teachers are trained in afternoon sessions on the campus and college faculty and students help teachers and high school students in the high school.

Any student at Millsaps has the opportunity to learn BASIC quickly in a special one-hour course offered each semester. The more interested student can follow this with additional computer courses.

The 8/E has brought a new dimension to the educational process at Millsaps through interactive time-sharing. It is felt that "interaction" rather than "batch" is the best way to use a computer. And, at Millsaps, the computer is becoming a tool for the entire college community.

Computer configuration:

System	EduSystem 25
CPU	PDP-8/E
Core memory	16K
Peripherals	dual DECtape
Terminals	3 local teletypes 1 TV display terminal for classroom use 3 remote teletypes at local high schools
Remote-wired classrooms on campus	5
Courses using 8/E	12
Language most used	BASIC

Submitted by:
Dr. Robert A. Shive, Jr.
Millsaps College
Jackson, Mississippi 39210

MEDPA IN MAYNARD

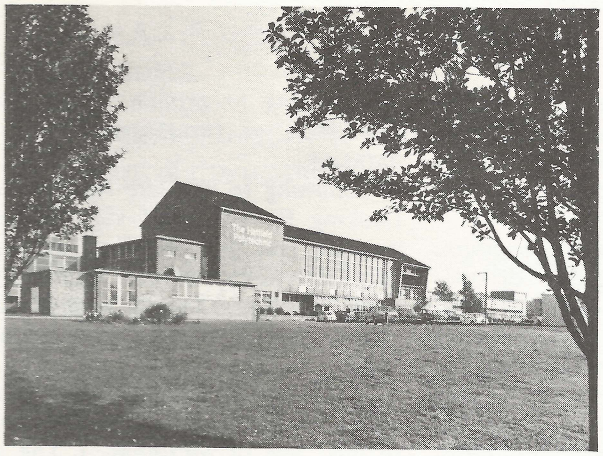
The April Meeting of the Massachusetts Educational Data Processing Association was held at the Maynard Office of DIGITAL on April 3, 1973. The attendees enjoyed a tour of the computer production facilities, followed by a three-part program. The program dealt with the Instructional and Administrative uses of the minicomputer and techniques for developing and financing a minicomputer project. Speakers included Dave Berry, DIGITAL Educational Specialist, Alice Peters, DIGITAL Secondary School Marketing Specialist and Ed. Sousa, DP Manager of Melrose Schools, Melrose, Massachusetts.

> He who knows nothing, loves nothing. He who can do nothing, understands nothing. He who understands nothing, is worthless. But he who understands also loves, notices, sees.
> The more knowledge is inherent in a thing, the greater the love.
> Anyone who imagines that all fruits ripen at the same time as the strawberries, knows nothing about grapes.
>
> *Philippus Paracelsus*
> (1493-1541)

DECSYSTEM-10 AT HATFIELD POLYTECHNIC

At Hatfield Polytechnic, England, a total of 27 on-line computer terminals are available for general use in the Computer Centre's new building. Twenty of these are installed in individual work booths in a specially designed classroom, which is one of the features of the building. Terminals are also available in some Polytechnic laboratories where they are invaluable for the rapid processing of experimental results.

An important part of the work of the Computer Centre is its close links with schools and colleges in the region. 19 other establishments have computer terminals linked by Post Office Datel 200 services to the DECsystem-1050, either on a full-time or scheduled basis.



RIPON COLLEGE USES TIMESHARED-8

Ripon College installed its PDP-8/I in August 1970, with the primary purpose of providing its students with a modern computing facility which would serve to familiarize them with computer concepts and programming, and for use in problem solving within their specific academic areas. A secondary, although important, purpose has been to develop data processing applications for the College's administrative offices.

Ripon began its TSS/8 operation with six terminals and a nucleus of faculty and students who had previous experience with computers. Some had used the PDP-8/L which was purchased a year earlier by the Physics Department. Since then, student interest and usage of the TSS/8 has grown tremendously, with more than 40% of the College's 1,050 students actively using the computer, either directly as part of a computer science or mathematics course, or as an adjunct to another course. The College now has ten terminals on campus, all tied into the PDP-8/I, which is located in the Computer Center in the Farr Hall of Science. Many of the terminals are available to the students practically 24 hours a day, on an "open shop" basis.

PDP-8/L—PDP-8/I Interface

Ripon students have designed and constructed an accumulator linkage, or interface between the College's PDP-8/L and PDP-8/I to allow the two computers to "talk" to each other. Through this device, data can be transferred in either direction, facilitating the use of the 4K memory on the PDP-8/L as another peripheral device, or as a separately running program. Student written software for the interface includes a loader which loads the PDP-8/L from any of the three possible PDP-8/L storage devices (DECtape, disk or papertape) in either RIM, BINARY, or SAVE formats. A test program can be used to test the functioning of the interface. A scope package, PLOTPAC, has been added to the PDP-8/L, making storage and display possible under time-sharing. PLOTPAC is an interpreter, much like FOCAL, but includes features such as double-subscripted variables, string variables, disk data files and line printer output, and utilizes the two computers as parallel processors. While one computer is calculating, the other can be busy with another part of the program. Software is being written to accept data from external experiments when an interface between the PDP-8/L and a digital voltmeter is completed.

System Configuration

Ripon's PDP-8/I system configuration consists of the following:

System Designation	TSS/8 (Edusystem 50)
CPU	PDP 8/I
Core memory	16K
Peripherals	2 RS08 Disks 3 TU55 DECtape transports 13 teletype terminals 1 high speed pape tape reader 1 card reader 1 line printer (132 column)

Submitted by Robert L. Taylor
Director of Computer Services
Ripon College
Ripon, Wisconsin 54971

We at EDU firmly believe that the educational computer system not only enhances education, but contributes significantly to the development of the process of logical thinking. It gives students a framework for intelligently approaching other problem solving situations in school and life in general.

However, the computer is by no means the only outside tool or approach that educators should consider using. Reprinted below is an article on student research, a valuable tool in contemporary education. This article originally appeared in the February, 1973, issue of *The Teacher.*

THE STUDENT RESEARCHER: DETECTIVE OR PHOTOCOPIER?

BY JAMES W. HOERGER
Dr. Hoerger teaches
in the Great Neck (N.Y.)
Public Schools

BE HONEST—when you assign your youngsters a research project, are they going to turn into photocopying machines or will they be researchers in the true sense of the word?

Facetious question? Hardly. The research assignments of most students turn out to be sterile exercises in unselective copying. They are counterproductive tasks that are boring and fail even to transfer permanently some body of useful knowledge.

Far worse, they rob the student of the chance to grow intellectually by confronting real problems and solving them. Such so-called research anesthetizes a naturally inquiring mind that could have tasted the excitement and triumph of a real intellectual experience.

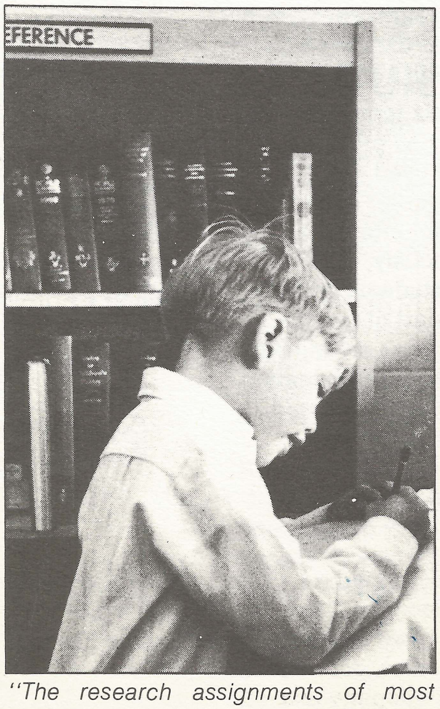
There are two basic types of research. One kind finds and brings together existing facts. The other seeks out hitherto unknown facts or identifies new relationships. The second type of work is rare—although not unknown—among students. The first is a common, but wholly respectable, mental accomplishment. All of us engage in this sort of research daily. We do it when we look up a telephone number or compare new car prices. Lawyers do it when they cite precedents in their briefs. Those books on the doctor's shelf mean that he must occasionally rediscover facts already known.

For the teacher with real insight, however, the purpose of research assignments must be larger than merely trying to transplant given bits of information. Research assignments are a vehicle—the best and sometimes only vehicle—for building certain vital skills, attitudes and appreciations. The possible outcomes of a research assignment make a fairly impressive list:

☐ *Learning to locate information.* The use of indexes, tables of contents, bibliographies, card catalogs, directories, etc.; the technique of skimming; the skills of grasping the central idea, finding a particular fact, etc.

☐ *Learning to digest and comprehend information.* Recognizing a need for prerequisite information; the use of supporting tools such as dictionaries and atlases; the interpretation of graphs, pictures, etc.

☐ *Learning to organize information.* Learning to classify, to make arrangements in terms of comparison and contrast, cause and effect, chronological order or logical succession, etc.



"The research assignments of most students turn out to be sterile exercises in unselected copying."

☐ *Learning to explain information.* The skills of summary and paraphrasing.

☐ *Learning to evaluate information.* Looking for points of view; understanding implied meanings; spotting inconsistencies, errors and omissions; choosing among competitive values, dealing with conflicts of authority.

☐ *Learning to locate and use nonwritten data* (increasingly necessary in this "age of McLuhan"). The art of interviewing, the techniques of observation and recording of objects and events, the use of experimentation; utilizing the film, radio, television, etc., as sources.

Obviously all of these objectives cannot be built into a single research assignment but the teacher must understand their value and be prepared to make each task yield some of these learnings each time such an assignment is given.

Research is essentially a decision-making process. Out of an overwhelming mass of information some things must be searched out and put together to satisfy a need. The key is to start out with a clear purpose in mind. It is better if this purpose comes from the pupil directly; but failing this, it must come from someone—the teacher. You cannot begin by simply saying, "We will each write a report on some European country. Mark, find out all you can about Germany."

Good research questions really probe. They tend to require the making of choices. Mark will grow much more if his teacher asks, "What are some of Germany's problems today? What events in Germany's past have affected people outside Germany? Which German leaders in art, politics, religion, science and other fields have affected our lives in America today?

How do the German people make a living? What do they buy from other countries and what do they sell to pay for it? If you were taking a two-week trip through Germany, what sights would you want to see? Why?"

After Mark gets going he is likely to run into snags. A good teacher will see these as opportunities in disguise. Mark finds three different population figures for Germany—one in a library book, one in his textbook and one in an atlas. His teacher asks him to try to account for the differences. "When was each book published? Were the figures for East and/or West Germany? Were the figures rounded off or exact? Were they estimates of census counts?"

As the assignment goes along, Mark's teacher watches its progress and makes suggestions designed to lay down unforeseen but profitable challenges. Mark has cut out dozens of pictures from magazines to paste in the report. The teacher asks Mark to recaption each one and use only those that he can tie into the text of the report. (Hopefully you don't grade these research reports by their weight!)

Or, reading over his notes with him, the teacher may remark, "Look, Mark, here you have a lot of information about famous Germans—Luther, Gutenberg, Beethoven, Einstein and so on, but you forgot *why* you were looking them up. I thought you were going to tell us how they made life different for us. Do we really need all this stuff about where Einstein went to school? Instead, why not find out how he persuaded President Roosevelt to spend money to develop atomic energy? Can you explain why you might not be in school today if it hadn't been for Johann Gutenberg? Which churches in our community wouldn't exist if it hadn't been for Martin Luther?"

Some of the worst "research" tasks given to children result from the mistaken notion that each child must have a different topic or one that he thought of by himself. It must be remembered that in terms of education, the byproducts of finding the information are much more important than the information itself.

With this in mind, teachers are unlikely to make such mechanical assignments as giving each child a different country or animal or person to investigate. This often leads to one child drowning in a sea of information about England or horses or George Washington, while another does not have enough material to make intelligent selections of data about Lichtenstein, aardvarks or Millard Fillmore.

Too often, also, a topic is defined thoughtlessly when a broader or narrower assignment would have demanded real thought from a student. Thus, "Sports of the Dominican Republic" is not likely to yield much but "Games and Holidays in Latin America" not only opens more vistas but will most likely involve problems in finding sources, organizing the data and explaining the information. A variety of skills and insights should result.

The teacher has an obligation to take into account not only the pupil's limitations as a reader but must assess realistically the available resources in the school, at home and in the public library. It is far better to give several children the same well-chosen topic than to give even one child an unworthy or impossible one.

"A teacher with real insight sees a research assignment as a vehicle for building vital skills and attitudes"

Too often, research for children is limited to books. Many of the same skills and a few unique ones can be developed using other source materials. Interviewing adults or other children is a valuable exercise. Here are some ideas I have used with interesting results:

☐ What was it like to go to school (or go to the store, celebrate Thanksgiving, or make a trip, etc.) in the old days? (This is an interview designed for use with grandparents or other senior citizens.)

☐ Children can be sent out to collect opinions on current issues—How do you feel about moving the library to Bayview Avenue? What kinds of pollution have you noticed here in Centerville? What can be done about it? (This research is the most sophisticated type—finding new information. Yet it can be done by children in the middle grades.)

Any child, even one who hasn't learned to read, can learn the significant skill of classifying, i.e., establishing criteria and applying them to individual cases. You don't believe it? Try asking a four-year-old to sort out some magazine pictures into piles. Let the piles represent food, houses and clothing. You'll be surprised to see that the child can do it.

Some learning can take place even after the report is written. The student can be asked if he found out what he originally intended to find or what he had expected to find. If not, why not? Or, what made him start looking for something else? Other students can help him and themselves by reading and commenting upon his report.

"In researching, the byproducts of finding the information are more important than the information itself"

Student researchers should be encouraged to write a final paragraph in which they state what they were unable to find or what some other researcher working along similar lines might want to delve into. Such writing is part of many doctoral dissertations and has applications in the scholarship of young researchers.

Children's research imposes a need for imagination and flexibility on the part of the teacher who must remember that more is being sought than the information itself. These other goals must be understood and constantly borne in mind. The alert teacher seizes opportunities to achieve these objectives when they present themselves before, during and after the assignment. ☐

THE INSTRUCTIONAL COMPUTER: GETTING IT ALL TOGETHER

A little more than a decade ago, the thought of an entire computer system dedicated to classroom instruction was a mere dream. Already there are many thousand such systems in both secondary schools and colleges and universities. Literally *millions* of students have learned from them in nearly every discipline, including such diverse areas as science, language, humanities, mathematics and business. In the 1969-1970 academic year alone, over 13,000 students specialized and earned degrees in computer related disciplines.

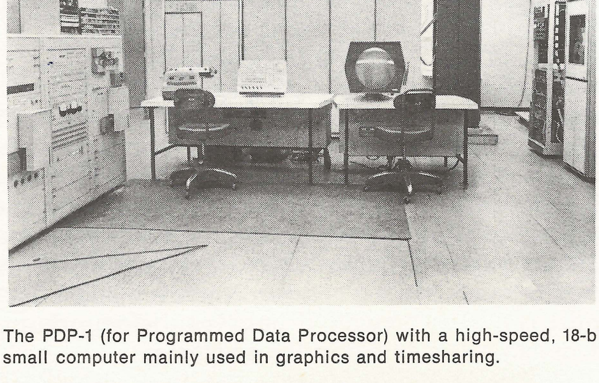
Invention of Minicomputer

The reason for the rapid introduction of computers into the classroom is the invention and development of the minicomputer. The then infant Digital Equipment Corporation invented the first such machine in 1960. Now with over 39 manufacturers and many times that number of firms selling the machines, Digital is still the leader in educational computing.

The reason for Digital's success in the educational field lies in the company's heavy emphasis on hardware and software development and in its willingness to dedicate its resources to the educational market.

Digital's invention of the "mini" in 1960 provided, for the first time, a computer system suitable to education that sold for $120,000. This came at a time when other systems cost a million dollars or more. The low cost computing power was just what education needed, and most of the "PDP-1's" manufactured were—and still are—used in universities.

Developments in memory design and packaging soon halved the price of Digital's PDP-1 system. On the theory that education, among other applications, did not need the massive power and accuracy of a machine with a large word size, Digital developed a computer with a 12-bit architecture. Evidently the company's guess was right, as the architecture has now sold well over 20,000 systems!



The PDP-1 (for Programmed Data Processor) with a high-speed, 18-bit small computer mainly used in graphics and timesharing.

Long-lived developments such as this are hard to come by in the rapidly moving computer field, but Digital introduced another in 1968. This time, it was a software, rather than hardware, innovation, and one aimed directly at education. The result was "Timeshared-8," the first multi-language, true timesharing system built around a minicomputer.

Expandable EduSystems

Recognizing that schools frequently do not have the funds to purchase even the "Timeshared-8" at one crack, Digital set both its engineers and its programmers to work to develop an *expandable* line of systems built around the 12-bit PDP-8. The objective was to allow a school to start with a minimum investment and gradually expand to the powerful Timeshared-8. The result was "EduSystems," a series of educational systems priced from approximately $6000 and up. Because of the unique "OMNIBUS" hardware and progressively more powerful BASIC compilers, no sacrifice of a school's initial investment was necessary to expand its system.

After a history of making systems smaller and less expensive for education, Digital's next step was surprising—a more powerful timesharing capability than the Timeshared-8. Such a system was in large demand to satisfy *both* the heavy instructional demands and the extensive administrative tasks of colleges, universities, centralized school districts and governmen training centers.

State-of-the-art New Products

Again, the development required the union of engineers and programmers. The engineers produced the PDP-11, the first minicomputer to interface all systems elements—processor, memory and peripherals—to a single bidirectional bus. The "UNIBUS," as it was called, enabled fast devices to send, receive or exchange data without processor intervention and without intermediate buffering in memory.

Meanwhile, the programmers were at work to produce timesharing software capable of handling instructional *and* administrative tasks. The result was RSTS-11, now able to support 32 users simultaneously while utilizing a wide variety of peripheral resources critical to administrative data processing. (See article or RSTS/E.)

What's Coming Next?

"What's next?" is a logical question now. Development seems to be aimed at more and more specific segments of education. "EduSystem-EDP" targets the secondary school's needs for automated grade reporting, attendance accounting, and student scheduling and record keeping.

"EduTech" systems are being developed to meet the needs of providing career training in vocational/technical schools. "EDUTEST" provides a means of automated test scoring right in the classroom. And still more systems are in the development phase. "What next?" Keep watching—you'll soon find out.

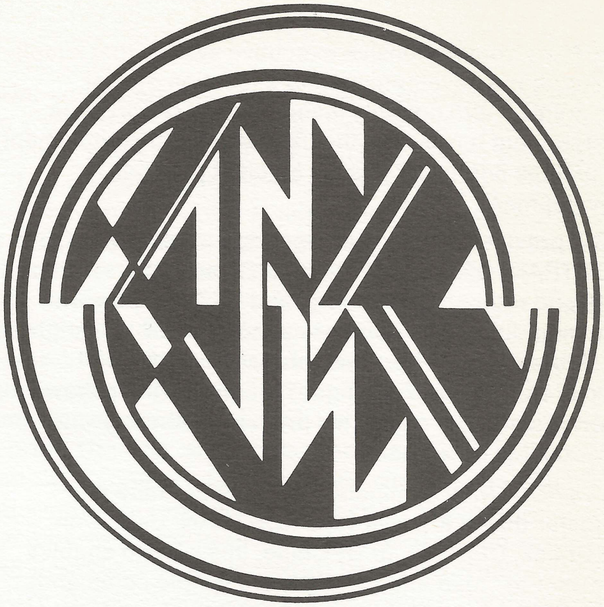
GOING AROUND IN CIRCLES

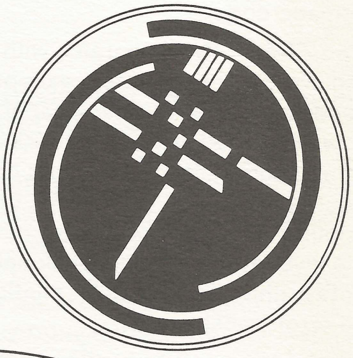
The circle below. Could it be the bottom of a mug? A large cookie? Cutaway view of a snowball? A happy face without the face? No, sorry. It's none of those.

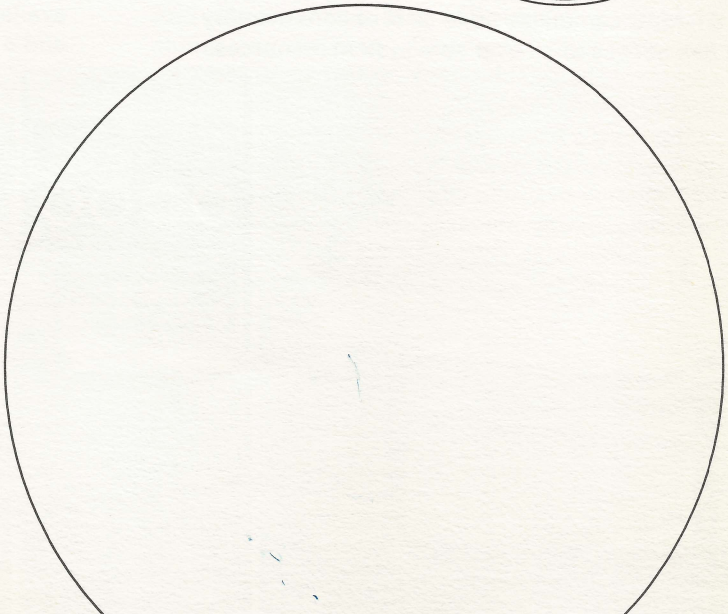
Actually, it's a circle looking for a design. It's precisely $3^{3}/_{4}$ inches in diameter, just a mite smaller than a DECtape reel. We're looking for a strong visual design to make into a label for notebooks, etc. as well as for a spinning DECtape. The wording on the label should say only "DIGITAL EDUSYSTEMS." And the DIGITAL must be the standard logo (similar to that on the front of EDU). No more than 4 colors. Remember, it must look good both stationary and spinning.

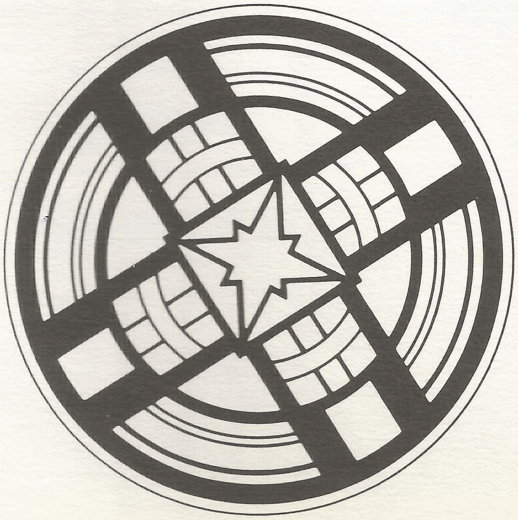
The person submitting the best design, which we will make into a label, gets $25! Double WOW!! Use the circle below or cut out your own. Send designs to:

EDU LABEL
Education Products Group
Digital Equipment Corporation
Maynard, MA 01754









OS/8–THE OPERATING SYSTEM FOR THE PDP-8

OS/8 is a comprehensive executive system that simplifies both the development and execution of user programs. OS/8 not only manages disk or DECtape storage, but it provides the user with a full complement of utilities and programs for efficient program development.

OS/8 provides a choice of language processors: OS/8 FORTRAN, OS/8 PAL-8 and SABR assemblers; absolute and relocatable loaders, and TECO, a powerful on-line editor. Other programs include PIP (a Peripheral Interchange Program), and an invisible ODT (Octal Debugging Technique) program which allows a programmer to debug his program without giving up valuable core space.

OS/8 FORTRAN eliminates use of paper tape and is faster than 8 K paper tape FORTRAN. Used with DECpack, DECdisk, or DECtape, this system enables the user to "load and go" with two simple commands. OS/8 FORTRAN permits over 200 symbols and up to 1300 floating point or 3900 fixed point variables per program or subroutine. Features include automatic link loading, Hollerith constants, program chaining, and the ability to mix FORTRAN and assembly language code.

RTPS FORTRAN IV operates with the optional Floating Point Processor and offers exceptionally fast execution speeds as well as real-time capabilities. FORTRAN IV allows up to 150 symbols and 3000 variables per program or subroutine. Among the compiler's special features are: direct access I/O, generalized array subscripting, Boolean operations, octal constants, multiple level overlays, n-dimensional arrays, mixed mode arithmetic, logical IF, multiple level overlays, and error trackback.

OS/8 BASIC can utilize up to 32 K of core memory and has access to all available system resources.

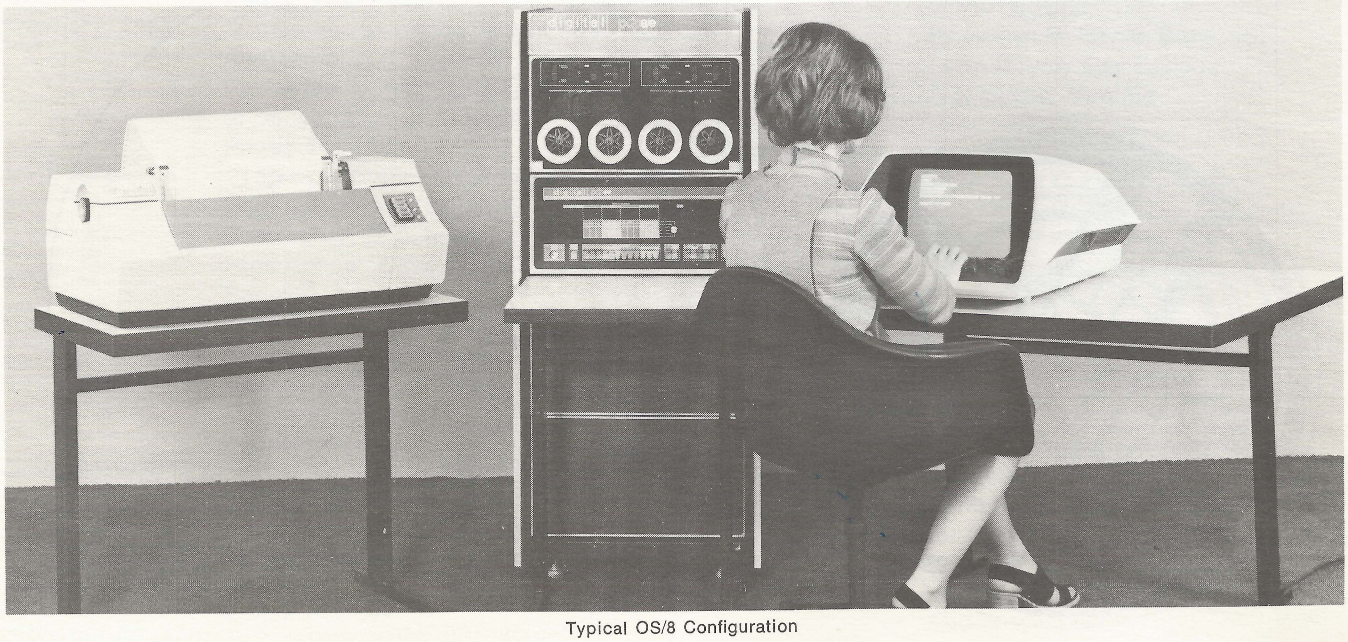
OS/8 SABR Assembler operates in 8 K from DECdisk, DECpack or DECtape. With this assembler, programs may be written without regard to page boundaries. The assembler also features relocatable binary code, external symbols, test pseudo-op, automatic paging and link generation to off-page symbols, and the ability to chain or call FORTRAN programs and/or subroutines.

The OS/8 PAL-8 Absolute Assembler is the most powerful assembler available for PDP-8 family computers. Capable of using all OS/8 peripherals, PAL-8 uses an advanced binary symbol table search to provide extremely fast assembly of large programs. PAL-8 permits over 800 symbols in 8 K or 1800 symbols in 12 K. Other features include conditional assembly, cross-referenced listings, a large number of assembler pseudo-instructions, literals and automatic link generation to off-page numbers, and page headings that consist of title, date, and page numbers.

OS/8 provides access to any one of 15 I/O devices. To add a new device to the system, the user merely adds a device handler. Devices do not need to be preassigned, but can be chosen for optimum usage at run time.

With OS/8, programs can be developed in modules and later combined for execution. And modules in different languages can be combined. For example, a machine language program can contain some FORTRAN subroutines and vice versa. OS/8 also includes an integrated BATCH processor for efficient stacked job processing.

OS/8 requires 8 K words of memory and expands to utilize the full 32 K. Two DECtape units are recommended for the tape resident system and a minimum of 64 K of disk storage for the disk system. Disks available include a 64 K DECdisk, a 256 K DECdisk, and a 1.6 M word removable diskpack system.



Typical OS/8 Configuration

RJE GOES PDP-8

You may remember reading in EDU #6 about the New Look in Remote Job Entry (RJE). You thrilled to the thought of strolling up to a warm, willing PDP-11 rather than a cold, unfeeling, hard-wired terminal. But then it occurred to you that you didn't own a PDP-11 and, worse, didn't see how you could afford one. So you framed a silent prayer to the computer gods: "Oh, if only DIGITAL could do all this on a PDP-8/E!"

Well, apparently the gods were listening, because now we can. The result is a brand new RJE terminal called, not surprisingly, Edu-Batch Terminal. To get one, here's all you need:

Qty	*Type*	*Description*
1	PDP8E-BE	8K Table-top CPU
1	DK8-EA	Clock, line frequency
1	DP8-EA	Synchronous modem interface
1	KG8-EA	Redundancy check option
1	LT33-DC	Teletype
1	CR8-F	Punched card reader, 300 cpm
1	QFEBT-SB	System software for 2780 emulation

You can order all that stuff in one shot under the code name EDUBT-DA, and it will set you back only $15,020.00, or $331 per month plus maintenance on our lease plan. Pretty cheap, huh? That's because we left out the line printer, which you really need to have a meaningful batch terminal. We left it out so you could choose the one you want:

Line Printers (select one):

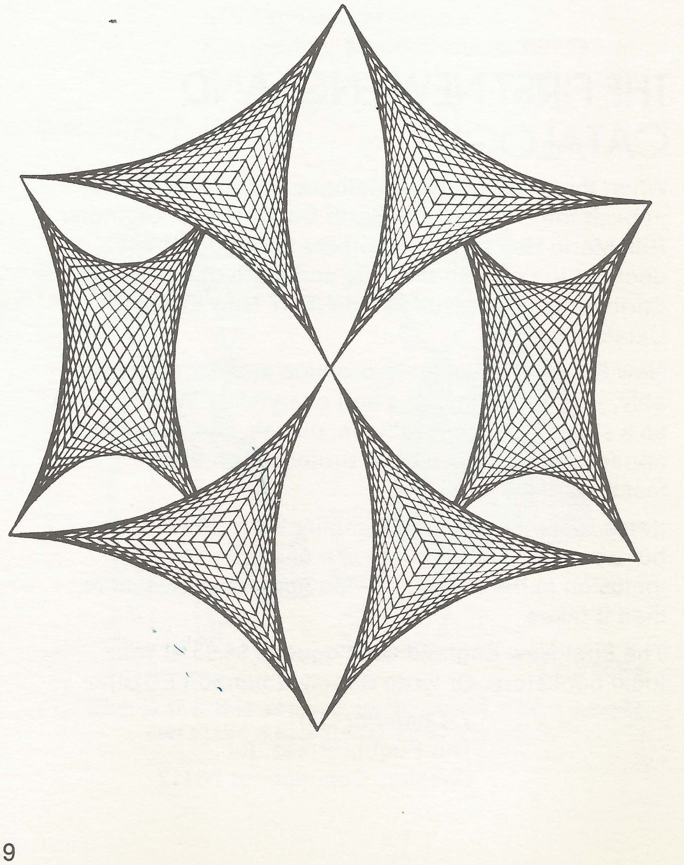
LS8-E	132 columns, 165 cps	$5,000
LE8-FA	80 columns, 300 lpm	$12,000
LE8-JA	132 columns, 300 lpm	$17,500

With this gear, you can pretend to be an IBM 2780 and communicate with any remote IBM 360/370 running OS/HASP. We impose some additional restrictions on the kinds of communication facilities which the package will support, but they turn out to be fairly common and hence not very restrictive. Should you become serious about ordering one of these, your Educational Sales Specialist will be glad to go over these considerations with you.

But RJE is only part of the story. The really neat thing about Edu-Batch Terminal is that, because it is CPU-based, it can do other things while it's not doing RJE. Appropriately configured, it can spend part of its life being an EduSystem of the desired flavor. Or acquiring data from laboratory devices. Thus a single machine can provide you with multiple capabilities: both RJE *and* interactive BASIC, or lab data acquisition, or anything else you can do with the ubiquitous PDP-8! That's something you can never do with your average hard-wired remote batch terminal.

Thus the school or department gets a real bargain: the flexibility and ease of use of a small local mini-computer plus the language capability and processing power of a large central system, all for only pennies a month more than conventional remote batch terminals (or conventional minicomputers)! Don't delay: get in line and get yours while supply lasts!

EduBatch Terminal System shown here can act as remote batch terminal to IBM 370 systems as well as running EduSystem 45 stand-alone.



Source Material for Educators

THE FIRST NEW ENGLAND CATALOGUE

When the Whole Earth Catalogue group decided to publish the LAST Whole Earth Catalogue, J. Chandler Hill, Marie Hall and some others at Pequot Press decided to carry on the idea and spirit of the Whole Earth gang. The result is the FIRST New England Catalogue.

New Englanders seem to produce and do, unpredictably, just about anything and everything. What started as a simple search for things, places, and activities apparently became a huge project of endless fascination.

Items in the catalogue exemplify life in New England but we at EDU particularly like one criterion for inclusion in the catalogue—an item must give more than it takes.

The First New England Catalogue is $4.95 at your local bookstore. Or write directly (mention EDU!)—

J. Chandler Hill
The Pequot Press, Inc.
Chester, Connecticut 06412

SUMMERTIME READING

Looking forward to the long hot summer? Wondering what to do with all the extra hours? Want to get yourself ready for September back-to-school days?

Is it worth a dime? For ten pennies we'll send you our latest-up-to-date bibliography of computer information-in-print. Ten pages loaded with references of articles, papers, textbooks, and reports.

Happy summertime reading from the Education Products Group, 5-5.

SOCIAL SCIENCES AND THE COMPUTER

The Fall, 1972 issue of *The Journal of Educational Technology Systems* contained an article entitled "Computers as Instructional Tools For the Social Sciences," by Daniel Klassen, Ph.D. (Huntington II Project) and Douglas James (Jackson Public Schools, Jackson, Mississippi).

The article examines the applications for computers in the social sciences and the obstacles that have prevented wider computer usage in these disciplines. Student reactions to the computer, guidelines for classroom use and the potential for future utilization are discussed.

Reprints of the article can be obtained by writing to:

Daniel Klassen, Ph.D.
Huntington II Project
SUNY
Stony Brook, New York

EDUHELP!!

What's that? EDUHELP??

Yes, EDUHELP. It's the informal secondary school newsletter of the DECUS Education Special Interest Group, EDUSIG.

EDUHELP is written by DIGITAL computer users, for DIGITAL computer users; it's been made possible largely due to the dedicated efforts of editor and chief contributor Chase Ambler of the Asheville School, Asheville, North Carolina. The first 15-page issue was published in January; it carried articles and inquiries submitted by teachers, interesting programs, long lists of classroom resource materials and more!

If you're currently using a DIGITAL EduSystem and you'd like to receive EDUHELP on a regular basis, just join the EDUSIG Group! Membership forms can be obtained directly from DECUS, Building 3-2.

TOY REVIEW

Yes, we realize that big people who are GENUINE COMPUTER USERS have no need for young children's toys. But perhaps you have children of your own or a younger brother or sister. And even if you don't know any young children, we still recommend a lively new publication called TOY REVIEW.

TOY REVIEW is even younger than EDU. The publisher, Lewis Clapp and his gang are just putting together their 4th issue. But have they done a job!!

Each issue has piles of useful information. Issue #3 carried lots of good stuff about Children's Theaters, toys for traveling, children's cooking, and toys to make yourself. Of course, the main contents are the concise but comprehensive reviews of hundreds of toys for pre-schooler through early teenager. Loads of photos and good solid information for the prospective toy customer.

Mention EDU when you write for a subscription. One year (4 issues) for $2; 3 years for $5.

TOY REVIEW
Subscription Department
383 Elliot Street
Newton, Mass. 02164

KALEIDOSCOPE

Kaleidoscope, a semi-annual publication of the Massachusetts State Department of Education, is a comprehensive guide to new ideas and projects. Funded by an ESEA Title III grant, *Kaleidoscope* is free for the asking!

Kaleidoscope 6, published last October contained descriptions of the innovative and promising projects being done in Massachusetts schools. *Kaleidoscope 7* is devoted entirely to Title III programs and *Kaleidoscope 8* will examine four program areas including Open Education, Media Programs, Alternative Schools, and Peripheral Programs.

For more information and the latest issue, write to:

Kaleidoscope
Bureau of Curriculum Services
182 Tremont Street
Boston, MA 02111

CARDBOARD CARPENTRY AND OTHER THINGS

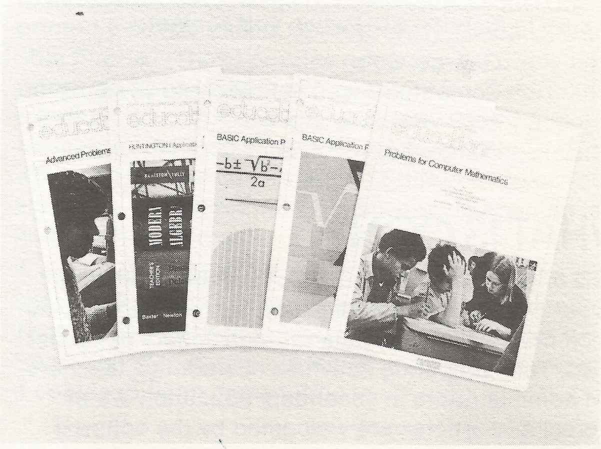
The *Workshop for Learning Things* sells things like cameras, films, and supplies; cardboard and the tools for working with it; things to build with, carve with, print with; furniture things . . . easels, workbenches, playground equipment, sand tables; storage things like cubbies and cubby boxes; and books to help you get started and to learn what others have done, several by children.

The Workshop also offers a line of services to schools and others from advice on purchasing, illustrative photography, an olio of other things, and even to publishing books by children.

They have a great catalog(50¢). Write for it. Tell 'em EDU sent you.

Workshop for Learning Things, Inc.
5 Bridge Street
Watertown, MA 02172

COMPUTERS AND CALCULUS



Five of the booklets available from DIGITAL on computer applications in mathematics.

How would you like to use your EduSystem in next year's calculus class? If you've thought about it but you need a helping hand to get started, we've got just the book for you!

Computer-Augmented Calculus Topics is a 40-page booklet written by Project SOLO at the University of Pittsburgh. It deals with a variety of topics including integration, differentiation, limits, and many more. It's available now for $1.50; quantity discounts apply.

MORE SOURCE MATERIALS

INTRODUCING C.B.I.S.

C.B.I.S., Computer Based Instructional Systems, Inc., was organized recently by a group of professionals with a diversity of experience and knowledge in the field of Computerized Educational Systems. This progressive and highly motivated group of educators and professional people has put together a corporation to provide consulting in the areas of education, industry and business.

C.B.I.S. is an independent organization that develops any or all portions of total teaching systems, including software and hardware, for industry, government and education. C.B.I.S. is concerned with solving problems involving training, professional development and continuing education and academic program development. The use of a systems approach embracing applications of educational technology, systems analysis and program analysis are standard procedures evolving from painstaking research.

A booklet called "Educational Systems for the Seventies" is available which further describes the philosophy and service of C.B.I.S. Also available are series of interactive exercises for use in teaching chemistry using EduSystem 25.

Be sure to mention EDU when you contact:

George Culp
Computer Based Instructional Systems, Inc.
4303 Woodway Drive
Austin, Texas 78731

WHAT IS CCN?

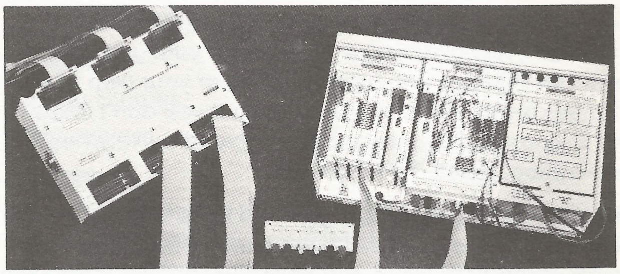
CCN or C^2N . . . both acronyms for Computer Club News, is a bimonthly publication designed to provide a communications medium for high school computer clubs. The computing activities of students, teachers, and administrators in secondary education are of interest and articles are welcomed by the editorial staff. CCN offers news briefs about student research, software developments, book reviews, contests and university programs, for graduating high school seniors.

CCN is sponsored jointly by the St. Louis Chapter of ACM and the University of Missouri—Rolla Computer Science Department. All news items or subscription orders ($2/year) should be sent to:

Theodore G. Lewis, Editor
Computer Science Department
University of Missouri—Rolla
Rolla, Missouri 05601

DIGITAL INSTRUMENTATION FOR THE DO-IT-YOURSELFER

Heath/Schlumberger Scientific Instruments have recently announced a comprehensive line of interfaces, analog to digital converters, digital instruments, timers, and logic function cards designed for use with PDP-8 family computers. The series of components are extremely complete and surprisingly economical.



Software is already in DECUS for use with the Heath/Malmstadt-Enke 800-Series and in addition Heath/Schlumberger have software packages to allow the computer system to:

1. Accept and store digital data from A/D converters, DVMs, keyboards, and data modems.
2. Output digital data to D/A converters, readouts of various types, printers, and data modems.
3. Process and compute data for signal averaging and integrating; curve fitting and smoothing; curve scaling.

This space cannot begin to describe the digital instrumentation available. A short note on your school or company letterhead will bring you the latest Heath/Schlumberger Scientific Instruments Catalog and a brochure which describes the 801E Computer interface in detail. Please mention EDU.

Heath/Schlumberger Scientific Instruments
Benton Harbor, Michigan 49022

Don't miss Page 17!

Ideas at Work

COMPUTER-DESIGNED DINNERWEAR

Ford has a better idea. Tom Ford that is. Among many other applications, he is using his PDP-8 computer in his classes at White Mountain Regional High School in Whitefield, New Hampshire, to design dinnerware. Imagine original student graphics creating mealtime elegance!

His student's write programs that generate teletype graphic designs on special paper. These paper disks are then laminated onto 10″ melamine plates by the Texas-Ware Company in Dallas. Kits of 50 blank disks are available in better craft and toy shops for around $2.95 under the trade name "Small Fry Originals."

If you'd like to try a project or two yourself, write for more information to:

Texas-Ware
Plastics Manufacturing Co.
2700 S. Westmoreland
Dallas, TX 75224

BASIC STRIPS KIT

BASIC Strips Kit. TTT Mathematics Lab., Patrick Henry Junior High School, Granada Hills, Calif. 91344. Cost, $3.50 (approximate).

This teacher-made activity kit contains 45 packets of cardboard strips that when assembled properly will be a workable computer program. There are actually only 9 programs in the entire kit ranging from simple to difficult. There are 5 packets of each program. Each line of the program is on a strip—all strips are the same length. Each program has a "master strip" as a guide with the program number on it. Each line of the program has been cut into pieces at random. When assembled properly they will be the same length as the "master strip." An incorrect assembly will cause the strip to be too long or too short and is a clue to the student that he is in error.

This is an excellent activity for learning to program in BASIC.—*Sheila K. Berman, Patrick Henry Junior High School, Granada Hills, Calif.*

Reprinted from *The Mathematics Teacher,* April 1973

GAMES FOR MOTIVATION

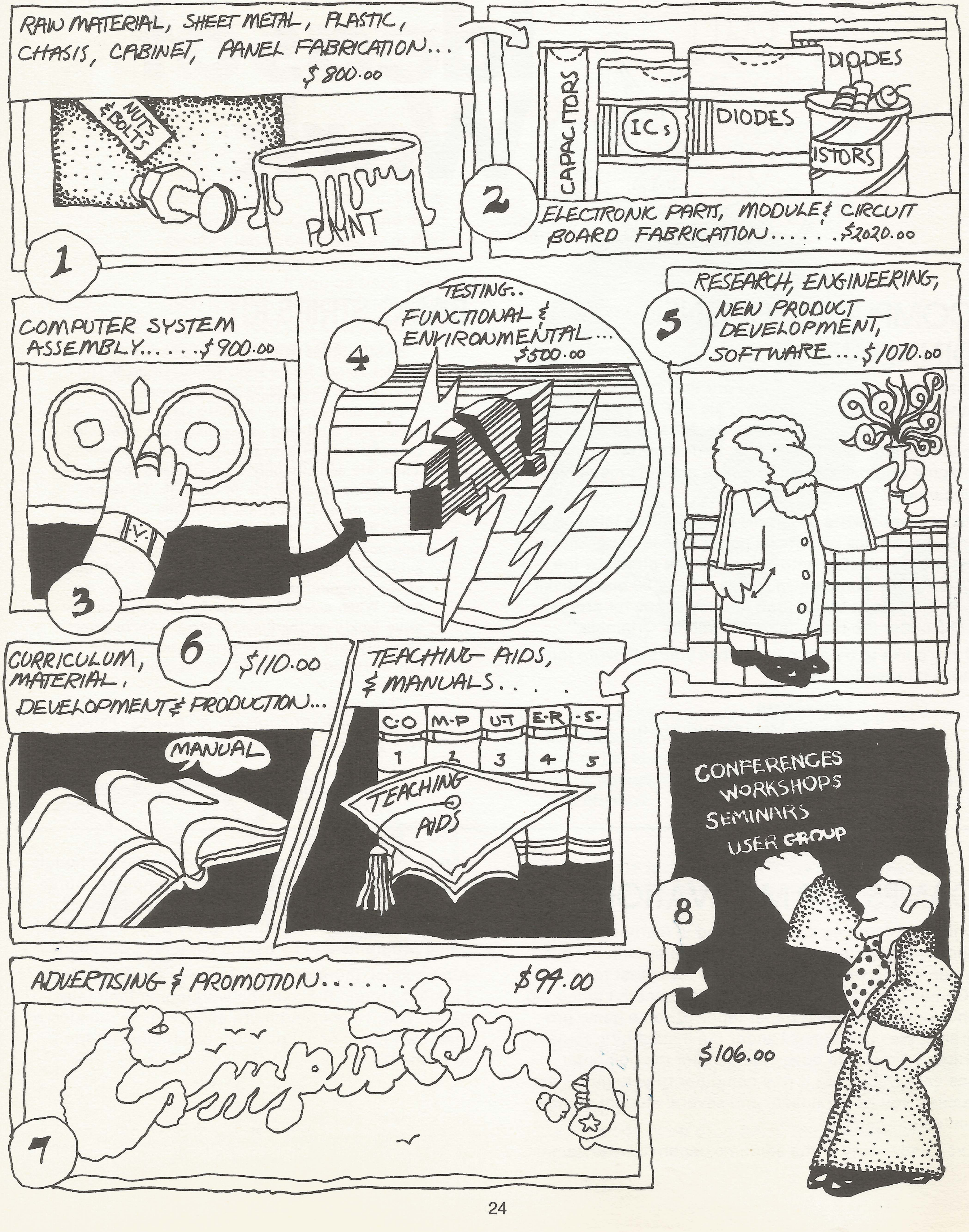
One way of getting kids interested in learning more about a computer is by letting them play with it. I put a sign on the wall of the computer room that read "Games Computer Bums Play"; underneath I taped big envelopes containing paper tapes of some game programs. We used Lunar Lander (an instant hit!), Bagels, Guess I (you try to guess the number the computer has chosen), Guess II (the computer tries to guess the number you have chosen) and several student written simulation games.

Eventually many of the students began to write games of their own. Those who could fit it into their schedule signed up for the second semester computer course. Other students managed to learn almost as much BASIC on their own by studying the print outs of the game programs and by asking me lots of questions.

After school, there are always two or three students huddled around the teletype working on their latest game. They're learning more about logical thinking on their own than I could possibly teach them if I tried to formalize it.

Submitted By:
George F. Towne
Highland Park High School
Highland Park, New Jersey 08904

$10,000* for A COMPUTER?...


RAW MATERIAL, SHEET METAL, PLASTIC, CHASIS, CABINET, PANEL FABRICATION... $800.00
NUTS & BOLTS
PAINT
1
2
CAPACITORS
ICs
DIODES
DIODES
ISTORS
ELECTRONIC PARTS, MODULE & CIRCUIT BOARD FABRICATION......$2020.00
COMPUTER SYSTEM ASSEMBLY......$900.00
3
4
TESTING.. FUNCTIONAL & ENVIRONMENTAL... $500.00
5
RESEARCH, ENGINEERING, NEW PRODUCT DEVELOPMENT, SOFTWARE...$1070.00
6
CURRICULUM, MATERIAL, DEVELOPMENT & PRODUCTION... $110.00
MANUAL
TEACHING AIDS, & MANUALS.....
C·O M·P U·T E·R ·S·
1 2 3 4 5
TEACHING AIDS
8
CONFERENCES
WORKSHOPS
SEMINARS
USER GROUP
$106.00
ADVERTISING & PROMOTION...... $94.00
Computer
7

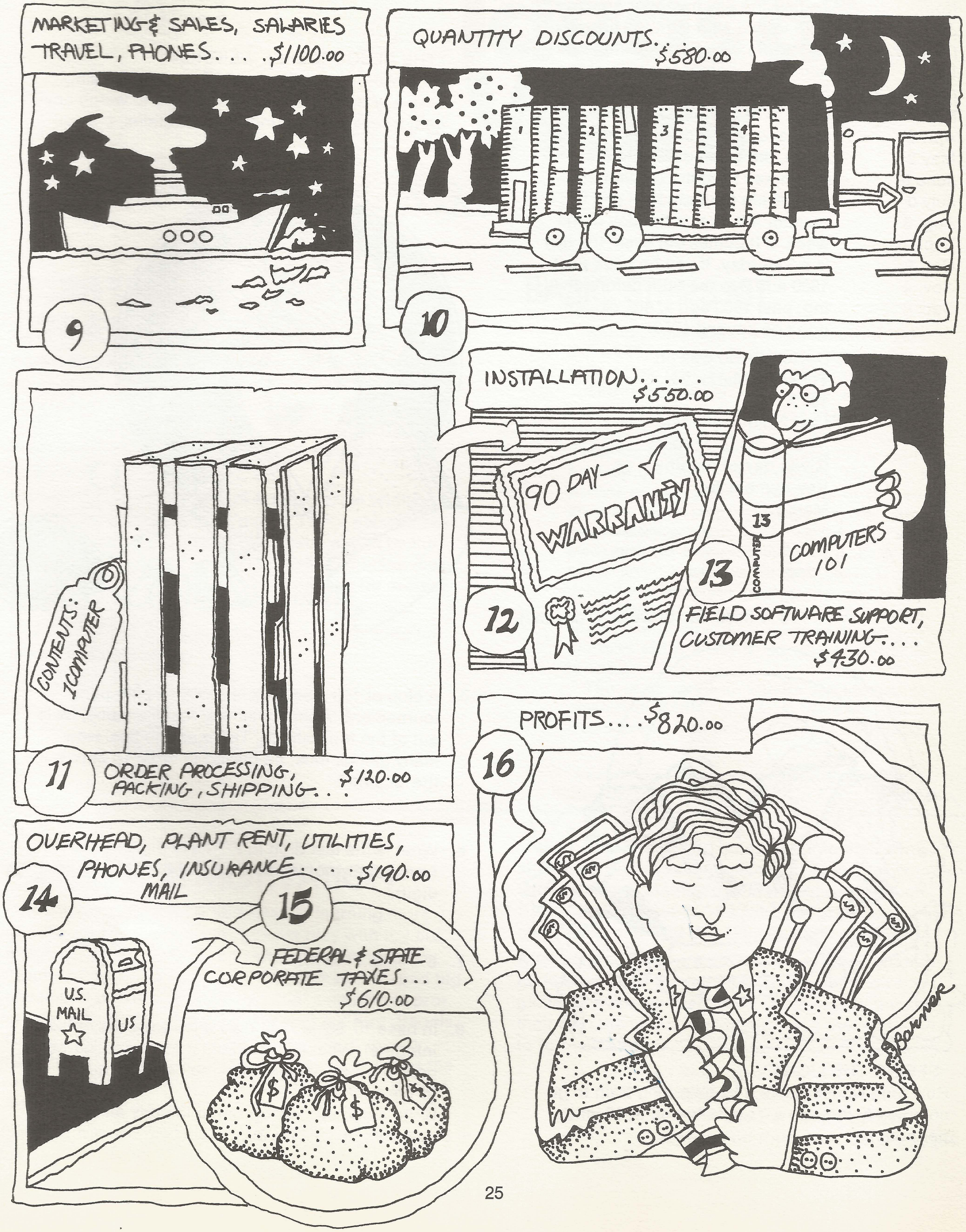
Yes, sir. And there are good reasons why it is $10,000 and not $4,000 or $50,000. To find out how the price of $10,000 is arrived at, follow the steps pictured below. Here is the story of the making of a DIGITAL educational computer system, from raw material to the time it goes to work in your school.

Look at the steps and you'll see how it balances out. A price is the sum of the costs, plus some profit.

Research and development insures that future products will offer more performance. Competition keeps prices from getting too high. This is the way it works out for a computer, but the same holds true for any manufactured item, be it bluejeans or a bus.

The idea for this article came from "$7 for a Pair of Bluejeans?" in the preview issue of *Scholastic Search.*

*2-user EduSystem 20


MARKETING & SALES, SALARIES
TRAVEL, PHONES $1100.00
9
QUANTITY DISCOUNTS . . $580.00
1
2
3
4
10
CONTENTS: 1 COMPUTER
11
ORDER PROCESSING, PACKING, SHIPPING . . . $120.00
INSTALLATION $550.00
90 DAY — ✓
WARRANTY
12
13
COMPUTER
COMPUTERS 101
13
FIELD SOFTWARE SUPPORT, CUSTOMER TRAINING $430.00
OVERHEAD, PLANT RENT, UTILITIES, PHONES, INSURANCE $190.00
MAIL
14
U.S. MAIL
US
15
FEDERAL & STATE CORPORATE TAXES $610.00
$
$
PROFITS $820.00
16
Bonner

GAMES COMPUTER BUMS PLAY

1. "COMPUTER DATING"

Given the following algorithm, write a program to print out any day of the week since 1753. It is a worthwhile exercise to print the day as "TUESDAY" rather than just "3."

Key	
Jan. 1	*(leap yr. 0)*
Feb. 4	*(leap yr. 3)*
Mar. 4	
Apr. 0	
May 2	
June 5	
July 0	
Aug. 3	
Sept. 6	
Oct. 1	
Nov. 4	
Dec. 6	

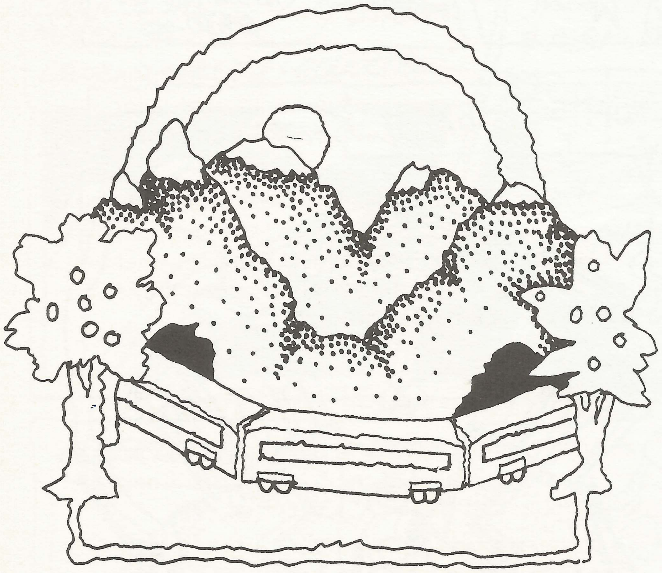
To find the day name for any given date to mid-18th century, proceed as follows: add the following four numbers together to arrive at the *Sum*—the last two digits of the year, $1/4$ of the last two digits (discard excess if it doesn't come out even), the given date, and the month-key from the column at the left. Divide the Sum by 7 and the number left over is the day of the week. If it comes out even, the day is a Saturday. If you go back past 1900 add 2 to the Sum before dividing; past 1800 add 4, etc. except don't go beyond 1753.

Example: Dayton Flood was on Tuesday, March 25, 1913.

Last 2 digits of year:	13
$1/4$ of 2 digits of year:	3
Given day of month:	25
Key number for March:	4
	45

$$\begin{array}{r} 6 \\ 7\overline{)45} \\ 42 \\ 3 \end{array}$$

3 = third day of week (Tuesday)



2. "SEEING THE LIGHT"

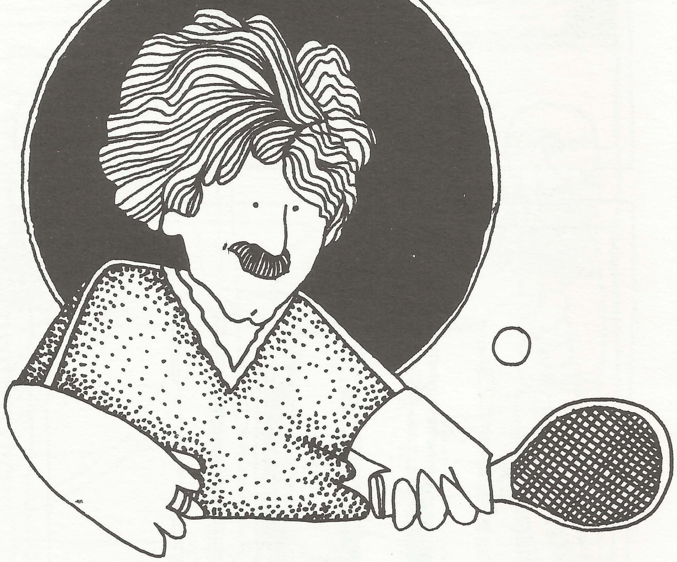
How long would it take a $1/2$-mile-long train to go completely through a $1/2$-mile-tunnel at 30 miles per hour?

3. "ABRACADABRA"

An old numerologist from the Left Bank reports a secret Grecian formula for finding prime numbers (numbers divisible by nothing but 1 and themselves, like 7, 17, 19): $W^2 - W + 41 = P$.
For every whole number, W, P is prime. Correct?

4. "THE RESOURCEFUL WEIGHER"

On a two-pan balance, what four weights, singly or in any combination, can be used to weigh any item from 1 to 40 pounds? No fractions, please!

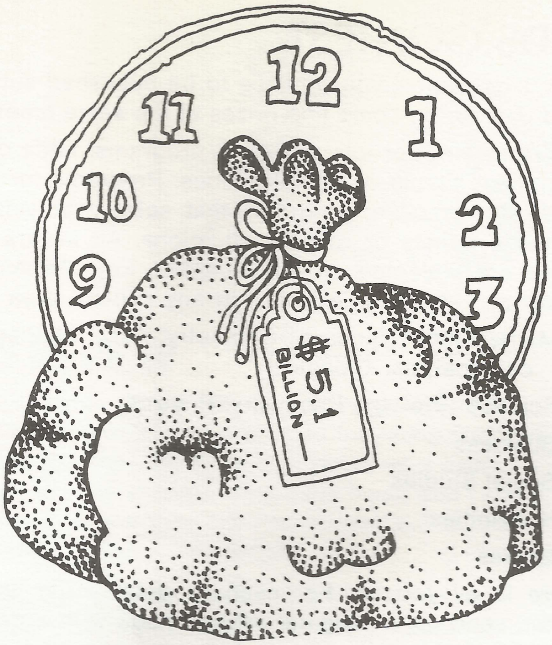


5. A club of 150 members is having a ping pong tournament. When a member loses a game, he is out of the tournament. There are no ties. How many games must be played in order to determine the champ?

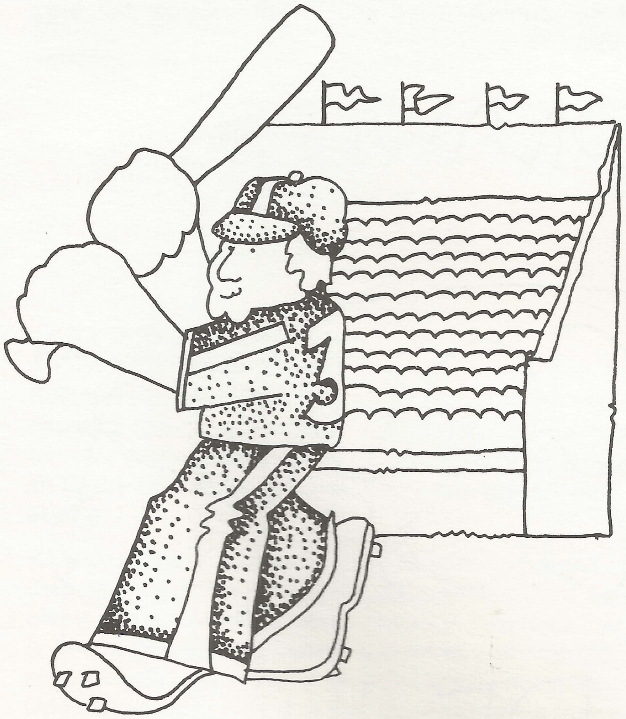
6. What is the last digit in 7^{1000}? Try this in BASIC (remember: not the entire number, just the last digit).

7. $8^m = 32$. Find m.

8. In base 10, 88^2 is 7744 (two different pairs of like integers). What is the smallest number squared in base 3 which will produce the same pattern?
In base 8?
Write a computer program to identify all such numbers up to base 20.



9. The proposed 1974 U.S. Federal Education Budget is $5.1 billion. How long would it take you to count that high if you counted $1 per second and counted 8 hours per day?



10. How many possible batting orders are there for a baseball team of 9 players?

Note: Problems 2, 3, and 4 are from the "1973 Old Farmer's Almanac."

GAMES COMPUTERS PLAY

The Education Products Group is currently in the process of collecting for publication the most comprehensive, all-embracing collection (conglomeration?, bunch?, herd?) of computer games known to BASIC-speaking man.

WE NEED HELP!!

Namely, more games. Please submit games as follows:

1. A complete listing (on *white* TTY paper with a reasonably good ribbon).
2. One or two sample runs.
3. Paper tape of program (tape not absolutely vital—if possible, submit on fanfold tape).
4. BASIC language requirements or limitations (or machine).
5. Your name, address and phone number.
6. Original source of program (if known).

Authors and submitters will be given full credit in the book.

Send your programs to:

GAMES
Education Products Group (5-5)
Digital Equipment Corporation
Maynard, Massachusetts 01754

Anyone submitting an original game will receive a FREE copy of the entire GAMES booklet.

DAMNABLE PUZZLE

If you really go for those "fit the people to their occupations, houses, etc." puzzles, here's one for you. In the March, 1973, issue of Intellectual Digest, they printed a puzzle called, appropriately enough, "Damnable Puzzle." Those puzzles generally get pretty hairy when you have more than 5 people, etc. to start fitting together. Well, this one has no fewer than *12* people running a nice little shopping center of *12* businesses whose shops are decorated in *12* different color schemes. They gave out *12* souvenirs on opening day and so on and so on.

A good couple of hours worth of exercise for the gray cells. Pick up the March issue ID. Newstand all out? Then send a buck to Intellectual Digest, Carmel Valley Road, Del Mar, California 92014 and hope they kept a couple of back copies around.

VERBAL VOYAGE ANSWERS

In EDU #7 we promised to provide the solution to the puzzle that contained 29 computer words. Compare yours to ours. Did you find MORE than 29??

Teletype, processor, flowchart, program, data, assembly, simulation, loop, bytes, user, terminal, edusystem, software, timesharing, matrix, computer, output, peripheral, disc, memory, parity, hardware, input, accumulator, basic, variable, batch, constant, language.

101 PUZZLES IN THOUGHT AND LOGIC

Do you like puzzles like this, based on logic and reasoning?

> In a certain bank the positions of cashier, manager, and teller are held by Brown, Jones and Smith, though not necessarily in that order. The teller, who was an only child, earns the least. Smith, who married Brown's sister, earns more than the manager. What position does each man fill?*

If you like to entertain yourself and stretch mental muscles on problems like this or more difficult than this, here are 101 entirely new problems for which you need no special knowledge, no mathematical training—simply the ability to reason clearly.

Follow these problems through, and you will not only increase your ability to think in abstractions, but you will enjoy solving murder problems, robberies, will see what fishermen are liars, how a blindman can identify color purely by logic, and dozens of other interesting situations. Puzzles range from easy to relatively difficult, and will please both beginners and experts. Everything entirely new and original. Introduction discussing diagram methods of solving problems, connecting problem solving with general scientific method. *101 Puzzles in Thought and Logic,* by C. R. Wylie, Jr., Dover Publications, Catalog No. T367, Paperbound, $1.00.

Dover has over 25 other inexpensive books on mathematical puzzles, games and diversions. We recommend *101 Puzzles.* Ask for their latest catalog too.

Dover Publications, Inc.
180 Varick Street
New York, NY 10014

***Answer:**

The teller cannot be Brown, since Brown had a sister, while the teller is an only child. And he cannot be Smith, since Smith earns the most money. Therefore, the teller is Jones. Brown must be the manager, and Smith the cashier.

KIDS CONTEST

Hey kids! Here's your chance to be published authors and cash in on some fine prizes at the same time!

We're looking for lots of BASIC programs. Little ones, big ones, simple or complex ones. Programs for CAI, drill, and practice; programs that solve problems, or simulate games or real-life situations. All flavors and sizes are welcome. In any quantity. For elementary, secondary, or college level!! In any subject area like:

Mathematics (Algebra, Geometry, Trig, Mathematical Analysis, Calculus)

Science (Biology, Chemistry, Physics)

Business

Social Studies

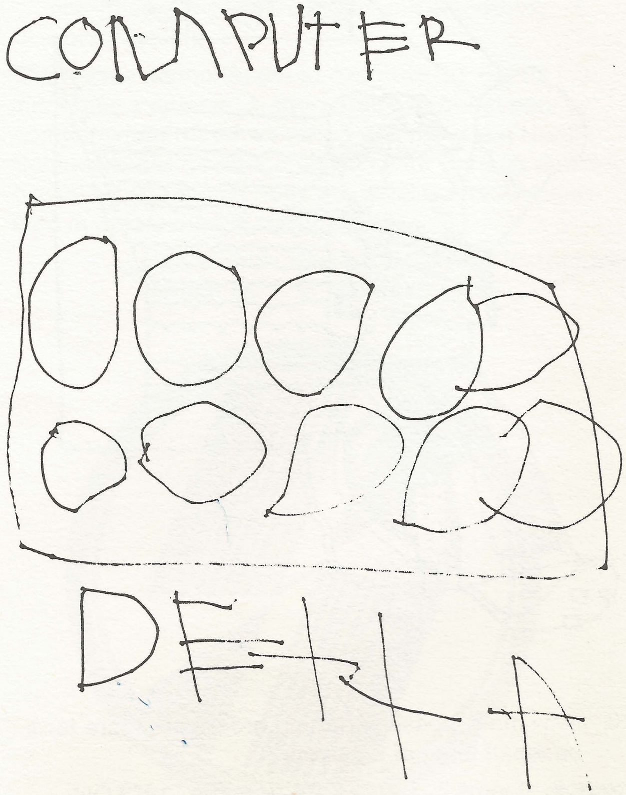
Humanities

Games

Here is all you do. For each program you'd like to enter, send us an *original listing* (made with a decent ribbon!), a sample run, a paper tape copy, and a one or two paragraph description of what your program is designed to do.

We'll *publish* the best ones. Of course *you'll* get full credit for authorship. We'll also submit them to the DECUS Educational Program Library. The top five entries will also receive a grab bag of terrific prizes.

The winning programs will be chosen for originality of approach and educational value. Tell your teachers about our contest. We'll accept entries from the big kids, too!



Computer by Detta (who is just 4 years old).

PRIME YEARS—Results of a New Year's Party with a Computer. . .1973

. . . is the 298th prime year A.D.

. . . the previous prime year was 1951

. . . the gap between 1951 and 1973 is 22 years—a gap which hasn't been equalled since the 17th century between prime years 1669 and 1693.

(Editor's Note: 73,1973, 31,1931 are primes, but 1951 is and 51 is not!)

Average gap

This can easily be estimated; we have had 300 prime years in 2,000. So one year in six or seven has been prime.

Our computer print out showed that the average gap has been getting bigger:—

Century A.D.	Number of prime years	Average gap
first	25	4
tenth	14	7
hundredth	9	11

The famous PRIME NUMBER THEOREM says (roughly speaking) that about the year N, the average gap will be about $\log_e N$.

Check:—

First century : $\log_e 100 = 4.6$
Tenth century : $\log_e 1{,}000 = 6.9$
100th century : $\log_e 10{,}000 = 9.2$

So the gap grows . . . but slowly. You have to square the year to double the gap.

$$1973 = 38^2 + 23^2$$

. . . so what?

. . . Fermat discovered that exactly half the primes are the sum of two squares

$$73 = 8^2 + 3^2$$

. . . to tell whether a prime is the sum of two squares, divide it by 4, if the remainder is 1, it is.

(Editor's Note: the exception is the even prime $1^2 + 1^2 = 2$)

How would you program a computer to find the two squares making up a prime?

. . . *very slow algorithm:* try all pairs of integers $0 \leqslant i, j \leqslant$ PRIME. The number of steps this takes is proportional to $(\text{PRIME})^2$

. . . *slow algorith:* try all pairs $0 \leqslant i, j \leqslant \surd$ PRIME. The number of steps is proportional to PRIME

. . . *fast algorith:* we found an algorithm which takes a number of steps proportional to $\surd$ PRIME.

If you can resist thinking it out for yourself, rotate the sheet.

Here's the idea, which we explain using 1973. First compute and store in a list $1^2, 2^2, 3^2 \ldots 44^2$; now, for each i, compute $1973 - i^2$ and see if it is on your list.

Courtesy of General Turtle, Inc.

GENERAL TURTLE is a corporation dedicated to developing a New Educational Technology. High in its priorities is improving the use of computers in schools. For more information, write to:

General Turtle, Inc.
545 Technology Square
Cambridge, Massachusetts 02139

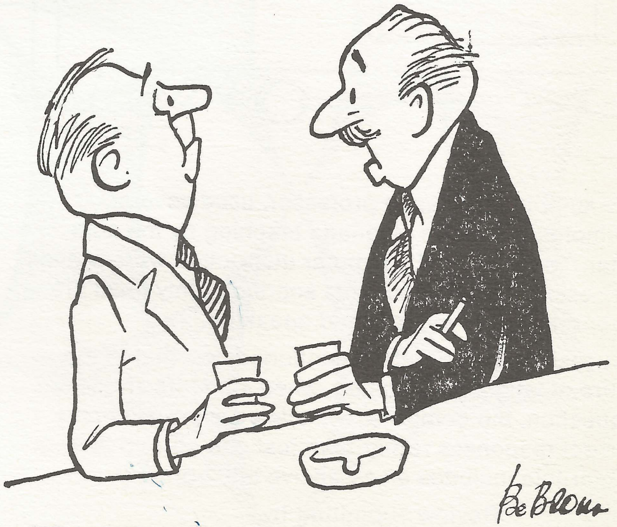
JOURNAL OF IRREPRODUCIBLE RESULTS

The JOURNAL OF IRREPRODUCIBLE RESULTS is a journal for scientists and others who are sufficiently sophisticated to smile at their own obtuse pursuits and laboratory blunders but who delight more in laughing at those of their confreres. Current subscribers include 10,444 extra curricula high school and college teachers of sundry types, 7686 research physiologists, biochemists, physicians, and associated skills, 3 Nobel prize winners, and 3 hod carriers.

The JIR is probably the cheapest journal around reflecting in no way on the value of its contents. It is difficult to imagine any researcher missing its topical reports of important new discoveries. Surely the world of science would be a better place for a wider and fuller understanding of Gordon's Law, recently published by the JIR: "If a research project is not worth doing at all, it is not worth doing well."

Yearly subscription rate is $2 for 4 issues to be made in advance. Tell them EDU sent you.

Journal of Irreproducible Results
P.O. Box 234
Chicago Heights, Illinois 60411



WALL STREET JOURNAL

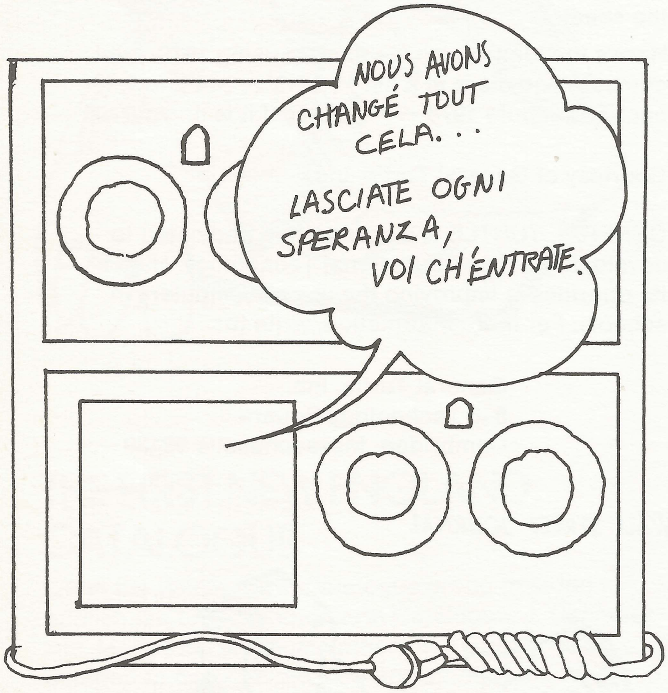
"This is the only country in the world where people can make a nice living by knocking it."

REVIEWS IN THE HUMANITIES

Computers and the Humanities
September, 1972, Volume 7, Number 1
"Current Trends in Computer-Assisted Instruction"
By John R. Allen, University of Manitoba
Pages 47-53

This article presents several new ways of teaching with the computer that are being used throughout the country. However, the author first gives reasons as to why computers are not as widely used as they should be in education. One reason was that programs cannot be standardized very easily and are usually available only to the school at which they were developed.

The most important reason that computers are not widely used in education is cost. Developing computer programs in the short-run is an expensive investment for many institutions. However, several universities are developing systems in which the cost of installing programs will be reduced.


NOUS AVONS CHANGÉ TOUT CELA. . .
LASCIATE OGNI SPERANZA, VOI CHÉNTRATE.

The author, a language professor, used several examples of foreign language teaching by the computer. The results of computer instruction were proved successful with the students scoring highly in all areas: comprehension, writing, and speaking.

One last thing the author mentioned was that in the future of language teaching, when students are asked a question, the computer will allow several different correct responses rather than just one correct answer. The article includes an extensive bibliography.

Review submitted by
Miss Debbie Seamands
Taylor University
Upland, Indiana 46989

Subscriptions to *Computers and the Humanities* are available to individuals at $9.50 per year ($20.00 for institutions) by writing

Computers and Humanities
Queens College
Flushing, New York 11367

Corollary publications dealing with applications in the humanities include:

Computer Studies in the Humanities and Verbal Behavior
(published quarterly, $10.00 per year)
Mouton and Cie, N.V.
Box 1132
The Hague
Netherlands

Calculi
Stephen V. F. Waite, Editor
Department of Classics
Dartmouth College
Hanover, N. H. 03755

Computers and Medieval Data Processing
Jean Gagné
Institut d'études médiévales
Université de Montréal
C. P. 6128
Montréal 101, P. Q., Canada

MUDPIE (Museum and University Data, Program, and Information Interchange)
Smithsonian Institute
Washington, D. C. 20013

Newsletter of Computer Archaeology
Sylvia W. Gaines, Editor
Department of Anthropology
Arizona State University
Tempe, Arizona 85281

The *Journal of College Science Teaching* is the official journal of The National Science Teachers Association. This quarterly publication contains from six to ten short—but valuable and well written—articles on topics of interest to college and high school teachers. The December issue contained articles on such topics as "Student Originated Projects" and "Student Ability and Individualized Instruction." The department, "How I Do It" contained a very good article, "Program Design for CAI." Other regular features include Innovations, Abstracts, Instructional Media, Books, and Equipment and New Products, among others. The subscription rate is $10.00 to anyone who is not a member of the organization. Contact: The National Science Teachers Association, 1201 16th Street, N.W., Washington, D. C. 20036.

Unless specified otherwise, these publications are available without charge to qualified applicants.

> "Look with your understanding, find out what you already know, and you'll see the way to fly."
> *Johnathan Livingston Seagull*
> Richard Bach

BOOK REVIEWS

BASIC Programming For Business, by C. Joseph Sass, Allyn and Bacon, Inc., Boston, 1972.

This book is ideal for use in a formal course, as a self-teaching manual for students learning BASIC on their own or as a reference source. Designed specifically for use by business students and businessmen, *BASIC Programming For Business* contains a wealth of examples and exercises drawn from business applications.

Game Playing With Computers, by Donald D. Spencer, Spartan Books, New York, 1968, $12.95.

This unusual book, completely devoted to computerized game playing, introduces more than 70 games, puzzles and mathematical recreations that may be programmed for a digital computer.

Over 25 complete programs are presented, most of which have never before appeared in computer books. Each of the programs includes a description of the game, flowchart, a program written in FORTRAN, BASIC, a description of how program works, and output produced by the program. In addition to an in-depth analysis of over twenty different types of magic squares and how they may be generated by a computer, the book features complete programs for prime numbers, Sieve of Eratosthenes, pick-a-number, blackjack, binary card games, the counterfeit coin game and 15 other puzzles.

To stimulate the interest of students and beginning programmers and to challenge the ingenuity of more experienced senior analysts, senior programmers and mathematicians, more than 50 games are presented for computer solution. These include such popular pastimes as Keno, Roulette, Go, Chess, Nim, Pantomino and Tic-Tac-Toe.

FOR COMPUTER CONSUMERS

Recent publications of interest to persons thinking of buying or leasing a computer in addition to those discussed in earlier editions of EDU include:

The Use of Computers in Instruction in Secondary Schools by Walter J. Koch, published by the National Association of Secondary School Principals, 1201 Sixteenth Street, N.W., Washington, D.C. 20036, 1972. Cost is $1.25 per copy. Twenty per cent discount on orders of 10 or more copies. It is a good introduction to computers with examples, some indications of funding services, and a short glossary.

The October, 1972, issue of *College Management* has as its theme, "Computers in the Curriculum" with ten major articles, including such topics as "Computers for Community Colleges" and "Computer Art." Single copies, $2.00. Contact 22 West Putnam Avenue, Greenwich, Ct. 06830.

ARTICLE REVIEWS

ANDERSON, RONALD E.; AND GROSS, JONATHAN.

Mini-computers in a social science instructional context. [in *Proc. ACM 1972 Annual Conf.*, ACM, New York, 952–963. See main entry *CR* **13**, 12 (Dec. 1972), Rev. 24,148.]

The authors relate their experiences since 1969 with a minicomputer (Digital Equipment Corporation PDP 8/L) in the Department of Sociology of the University of Minnesota. This computer was originally used in a laboratory configuration for social psychological experiments. As time passed the minicomputer was used to serve wider research and teaching needs. In order to accomplish this, numerous peripherals had to be added to the system. Once this was accomplished the Department of Sociology became the first such department to have its own time-sharing computer. In this paper the authors explore the minicomputer phenomenon, describe possibilities of use of the minicomputer in sociological research and instruction, and describe a social statistics package (*M*innesota *I*nteractive *S*ocial *S*tatistics Package) under development for their system. The costs of purchasing, maintaining and using the minicomputer system within an academic department are discussed.

D. E. Chappelle, East Lansing, Mich.

CHARTIER, MYRON R.

Learning effect: an experimental study of a simulation game and instrumented discussion.

Simulation & Games **3**, 2 (June 1972), 203–218.

With the current high level of interest in computer-controlled simulation games for instructional purposes, it is interesting to note the results of this study.

> It was hypothesized that subjects who participate in a simulation game with a discussion component will demonstrate higher learning outcomes at the cognitive and effective levels than will subjects participating in simulation without discussion, discussion without simulation, or neither (individual study).

Students were tested under all four conditions listed above, and the results showed that there were no significant differences among the four groups on cognitive performance, but there were with regard to affective measures (students in the simulation-with-discussion group expressed more "satisfaction" with their learning experience).

This research report emphasizes what should be obvious; that is, that there are no instructional techniques which automatically guarantee improvement in performance compared to other techniques. Research on other instructional techniques (CAI, programmed instruction, videotaped lectures, etc.) has shown that within any given method one can find examples displaying the same range of effectiveness as that found in any other method. It is clear that the structure and content of the materials are more important than the technique, and the results reported in this study simply confirm that simulation games are no exception.

J. L. Rogers, Cleveland, Ohio

Reprinted from *ACM Computing Reviews*, March 1973

FROM "THE MATHEMATICS TEACHER"

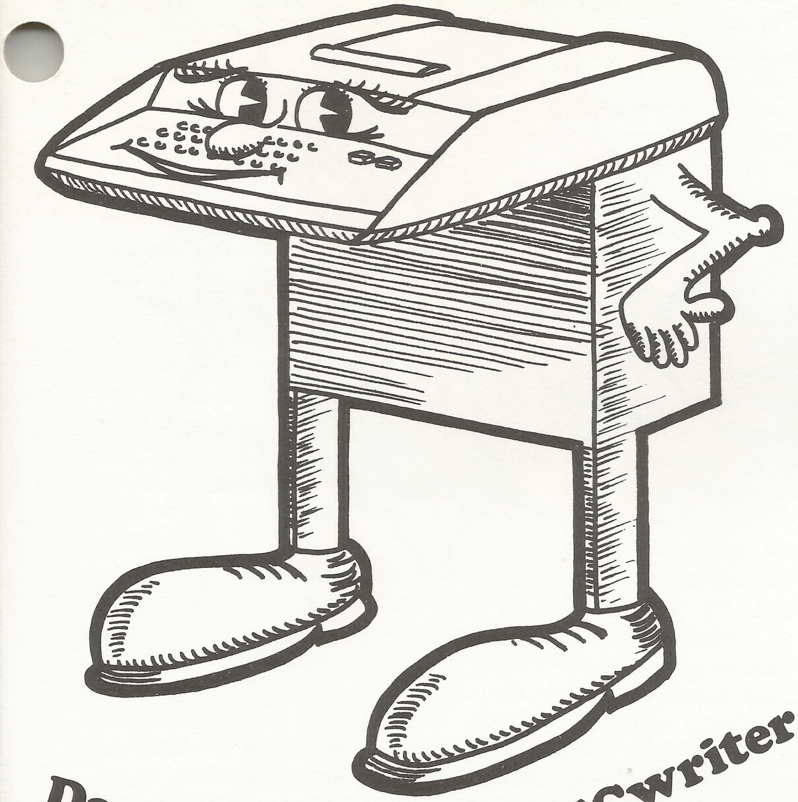
A Bibliography of Computer-Related Materials for High School Mathematics

Beginning with the April, 1969, issue of the *Mathematics Teacher,* an official journal of the National Council of Teachers of Mathematics, a new department called "Computer-Oriented Mathematics" was launched. Later this department was dropped in favor of a department entitled "NEW Products, NEW Programs, NEW Publications." In any case, some excellent materials have been published since that April, 1969, issue. A Partial listing follows:

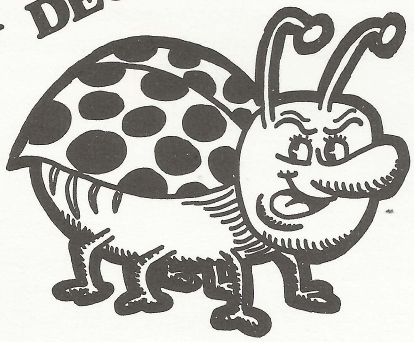
April, 1969	"Quadratic Equations—Computer Style" By Thomas E. Kieren, University of Alberta, Edmonton, Alberta Pages 305-309
May, 1969	"Generating 'Random' Numbers Using Modular Arithmetic" By Brother Arthur Indelicato, F.S.C., De La Salle High School, Minneapolis, Minnesota Pages 385-390
October, 1969	"Prime Triplets" By Joseph Hirsch, Henry Ford High School, Detroit, Michigan Pages 467-471
December, 1969	"A Case Study in Mathematics—The Cone Problem" By Nickander J. Damaskos, School of Engineering, PMC Colleges, Chester, Pennsylvania Pages 642-649
January, 1970	"Patterns in Algorithms for Determining Whether Large Numbers are Prime" By Aaron L. Buchman, Associate, New York State Education Department, Albany, New York Pages 30-41
February, 1970	"Computer-Extended Instruction: An Example" By William S. Dorn, University of Denver, Denver, Colorado Pages 147-158
April, 1970	"Topics in Numerical Analysis for High School Mathematics" By Stephen D. Schery, Cassville High School, Cassville, Missouri Pages 313-317
May, 1970	"Polynomial Synthetic Division" By Irwin Hoffman and Larry Kauvar, George Washington High School, Denver, Colorado Pages 429-431
October, 1970	"Predicting the Outcome of the World Series" By Richard Brown, The Phillips Exeter Academy, Exeter, New Hampshire Pages 494-500
November, 1970	"An Eulerian Development for Pi: A Research Project for High School Students" By Thomas W. Smithson, Evanston Township High School, Evanston, Illinois Pages 597-608
December, 1970	"A Student Computer That Really Works" By William A. Leonard, Mission San Jose High School, Fremont, California Pages 681-684
January, 1971	"Introducing Matrix Algebra with Computer Programming" By Margariete Ann Montague, University of Wisconsin, Madison, Wisconsin Pages 65-72
February, 1971	"Gauss, Computer-Assisted" By Helen S. Hughes, Hudson, Wisconsin Pages 155-166
October, 1971	"Evaluating the Cosine Function" By John C. Warren, The Phillips Exeter Academy, Exeter, New Hampshire Pages 557-561 "Digital Bracelet for 1971" By Charles W. Trigg, Professor Emeritus, Los Angeles City College, Los Angeles, California Pages 561-571
January, 1972	"Building a Conceptual Computer" By Frederick H. Bell, University of Pittsburgh, Pittsburgh, Pennsylvania Pages 57-60
April, 1972	"Inductive Thinking Using the Computer" By Joseph P. Pavlovich, Shady Side Academy, Pittsburgh, Pennsylvania Pages 329-332
October, 1972	"You Too Can be a Computer, or Part of One" By James M. Henle, Burgundy Farm County Day School, Alexandria, Virginia Pages 553-559
November, 1972	"Happy Integers" By Donald C. Duncan, Milton Academy, Milton, Massachusetts Pages 627-629
December, 1972	"Decimal Expansions of Rational Numbers" By Mark Manchester, North Colonie Central Schools, Shaker High School, Latham, New York Pages 698-702
January, 1973	There are many articles related to computers in this issue.
February, 1972	"The Binary Adder: A Flow Chart for the Addition of Binary Numbers" By Alfred Ellison, New York University, New York, New York Pages 131-134

MORE COMPUTER CRITTERS

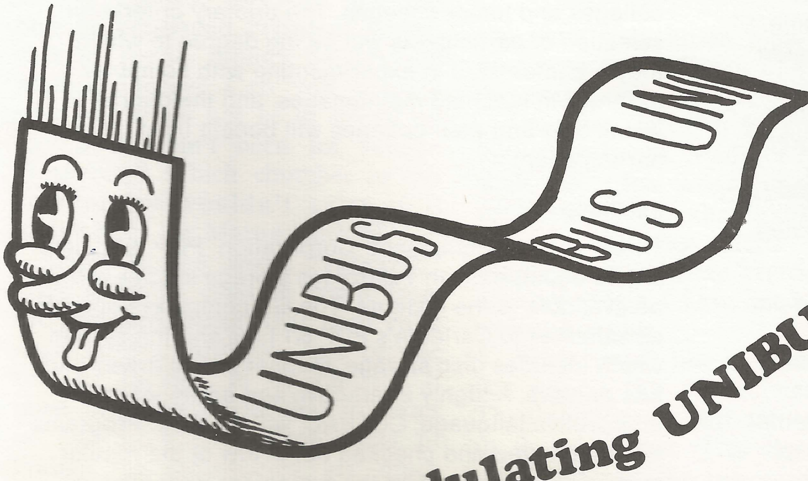
Cut out these cute lil' critters along the heavy black line. Color with crayons, water colors, or "Flair-" type pens. Paste on walls, notebooks, IBM machines, etc. Or make a really keen mobile!



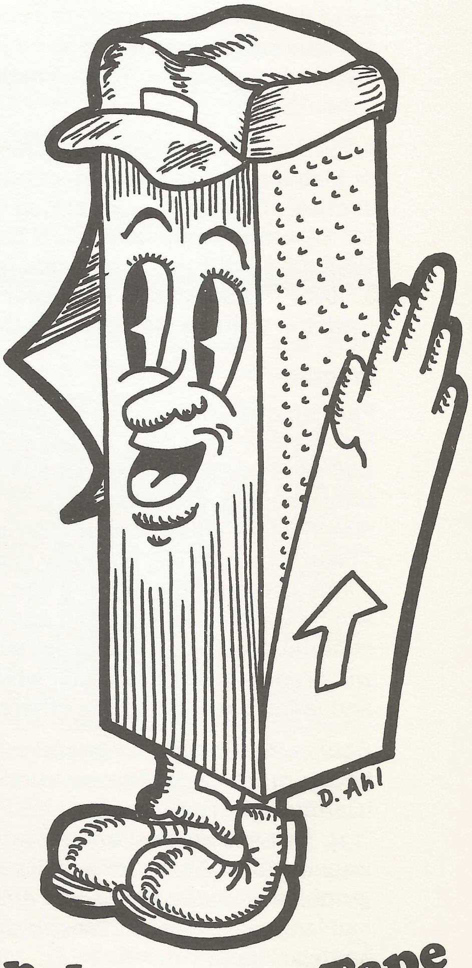
Darling Dorothy DECwriter



Pester Program Bug



Ubiquitous Undulating UNIBUS

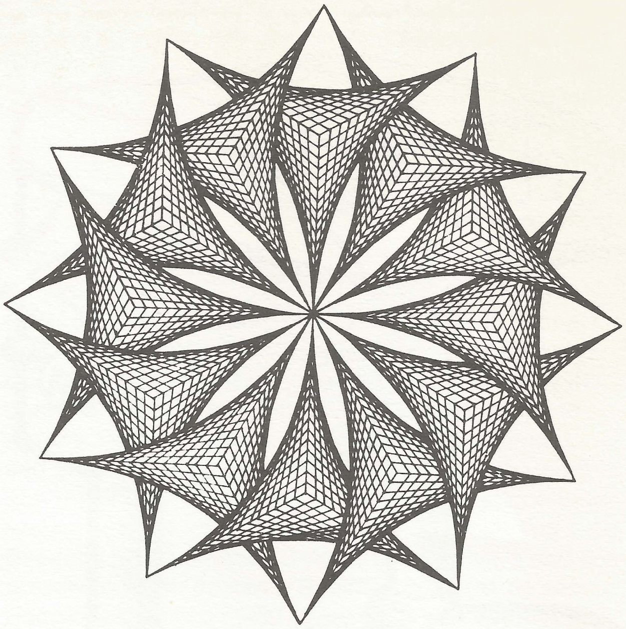


Punchy Paper Tape

NSF SUMMER INSTITUTES

Among the NSF summer institutes for college teachers, more programs involving computer applications are appearing. These courses are designed to allow the participants to explore particular subject areas in depth. Among the listings for this coming summer are:

- Computer-Generated Graphical Materials. Carleton College, Northfield, Minnesota, Dr. Roger B. Kirchner, Department of Mathematics. (See separate article.)
- Computer Science in Social and Behavioral Science Education University of Colorado, Boulder, Colorado, Dr. David E. Bailey, Department of Computer Science.
- Computer Use in Undergraduate Science Instruction Illinois Institute of Technology, Chicago, Illinois, Dr. Harold Weinstock, Department of Physics.
- Computerized Algorithms for Locational Problems University of Iowa, Iowa City, Iowa, Dr. Geraud Rushton, Department of Geography.



NSF COMPUTER GRAPHICS SUMMER INSTITUTE

Even though it is probably too late to apply, the following announcement should be of interest to those involved in computer-related mathematics in secondary schools.

A Six Week NSF Summer Institute for College Teachers of Mathematics in Computer Graphics and the Production of Computer-Generated Graphical Materials for Teaching Mathematics will be held at Carleton College, Northfield, Minnesota, from June 25 to August 3, 1973. The director is Professor R. B. Kirchner of the Carleton College Mathematics Department.

Program

Participants will take two courses, each meeting $1^1/_2$ hours a day for 5 days a week for the first 5 weeks, and be engaged throughout this time in the planning, programming, and production of computer-generated materials for classroom or individual student use. These materials will normally take the form of 35 mm slides and possible Super 8 film loops. The sixth week will be devoted to a sharing and evaluation of the materials prepared. It is expected that each participant will prepare at least one unit which can be duplicated and made available to the others.

Course A—Computer Graphics Introduction to a particular graphics facility; instruction in COLPAC (Carleton On-line Language for Plotting and Calculating); formal definition of the syntax of COLPAC in Backus normal form; examples of the use of computer graphics in mathematics and education; other graphical language; more advanced computer graphics hardware applications.

Professor R. W. Nau

Course B—Mathematics Methods for Graphical Applications Numerical and algebraic techniques for implementing mathematical ideas on the computer scope—scaling, two and three dimensional coordinate transformations, procedures for rootfinding, sketching implicitly defined curves, interpolation, approximation by polynomials and splines, solution of difference and differential equations. Examples from teaching programs already written, and from those suggested by participants.

Professor R. B. Kirchner

These courses are designed to help the participants plan and produce their own teaching aids. The staff will be available for assistance in all stages of production.

Participants

Twenty participants will be selected from four year colleges and junior colleges. The primary criteria for selection of participants will be the degree to which they are interested in experimenting with computer graphics in teaching mathematics, and the degree to which they and their colleges will benefit from participation.

Facilities

Three Digital Equipment Corporation PDP 8/L computers equipped with Tektronics storage scopes will be available to the institute. The 8/L computers operate as satellites to Carleton's PDP 8/I time sharing system which includes disc storage, magnetic tape drives and line printers. A highly interactive and easily learned interpretive language, COLPAC, will be used. Programs can be created and checked out at any of the regular terminals, and stored on the system for later filming at one of the graphics terminals. 35 mm cameras and a Super 8 movie camera will be available.

MATHPOWER

WHAT IS MATH FOR?

...... Columbus used it to find his way across the ocean.

...... N.A.S.A. uses it to send spacecraft to the planets.

...... Newton used it to understand the movement of the planets.

Used thus, math is a source of **power:** power to do what men could never do before; power to think what no man had ever thought before.

But what does math do for a student in your school?

What power of action does it create?

What new horizons for the imagination does it open?

Some students find some of the math you teach them personally exciting. For most, it is impersonal, irrelevant, alienating ....

This state of affairs need not continue! Modern technology makes it possible to build environments in which mathematics can be used in a personal, purposeful way by **ALL.**

GENERAL TURTLE PUBLICATIONS.

'The New Educational Technology'—a new substantial bi-monthly newsletter planned to be a forum for the exchange of ideas on the new educational technology.

Subscriptions are welcomed at $5 per year.

General Turtle Inc.,
545 Technology Square,
Cambridge, Massachusetts 02139.

GENERAL TURTLE INC. HAS BEEN CREATED TO MAKE THIS KIND OF TECHNOLOGY AVAILABLE.

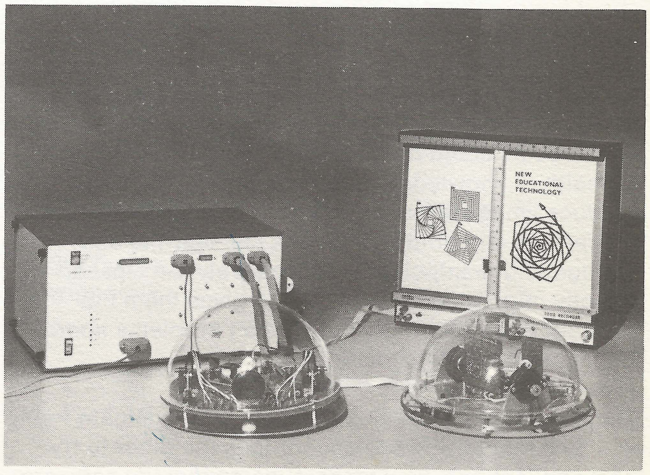
Our first step has been to make available the computer-controlled TURTLES and MUSIC BOXES developed at the Massachusetts Institute of Technology. These devices enable a student to translate a mathematical idea into real action.

For example, a MUSIC BOX allows a computer to act like an obedient orchestra, willing to play for you any piece you care to compose .... provided you know how to describe the music in a mathematical language. **If you love music, that might make math real.**

Not everyone loves music ..... perhaps you would rather have the computer draw for you ..... or perhaps you like to tackle mazes. We have devices to give the computer power to draw, to explore mazes, and to do many other things.

"CRAZY! ..... how can children who can't even **add** learn to program computers to play music?" It does seem crazy, but it happens!! In the M.I.T. LOGO experiments, children of all grade levels of former scholastic performances have learned to program computers to do a variety of such things.

The reason is really quite simple, though revolutionary: All children **CAN** learn and will **LOVE mathematics** provided it serves a purpose. Our problem is to provide purposes—



General Turtle Devices: Controller for Teletype and three other devices ($1,300), Turtle with touch sensors ($800), Plotter ($1,000) and Music Box (not shown—$600). These devices run on DIGITAL DECsystem-10 and PDP-11 (RSTS-11) computer systems.

STUDENTS RUN THE SHOW IN DELAWARE

There is an ongoing computer project in Delaware which appears to be working. The problem which is being addressed is the same problem which others have addressed before, namely how do you get large numbers of students and teachers at the secondary level involved with meaningful computing activities? Where others have experienced only partial success, Project DELTA is making great progress.

Project DELTA initiated a new approach. With funding from Delaware School Auxiliary Association, a large mini computer, DIGITAL PDP 11/20 RSTS system, was purchased. The computer resides in the Department of Electrical Engineering of the University of Delaware in the care of Dr. David M. Robinson, Associate Professor Project Director, Mrs. Teresa O. Green, Coordinator and Research Associate and the college and high school students who are responsible for the entire center operation. There are 17 schools throughout the state from which some 2500 students remotely access this computer. It is the student - learning environment which is critical to the success of the project.

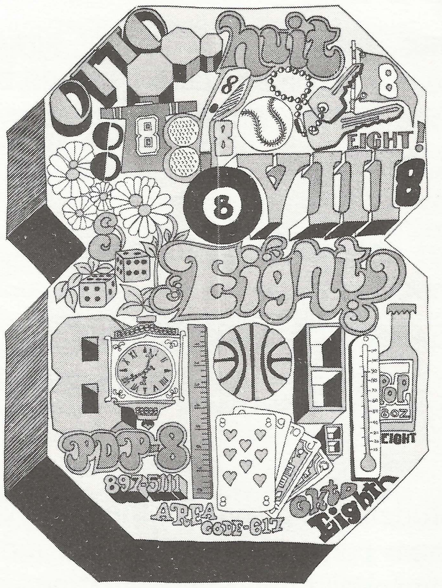
Long involved with computers in education, the project initiators together with the funders, D.S.A.A., looked at the attempts of others who had produced only marginal results. They then made several assumptions as the basis of their own project: that within the present structure of education, teachers have little or no time to try innovative methods or to learn enough about computers to warrant their trying to do so; that the youthful mind is unencumbered by constraints and is willing to question, try, and learn new things; that much learning takes place within peer groups; that greater rapport can be established between teacher and student if learning - teaching is bidirectional activity; that responsible and creative computing will occur only when the users become knowledgeable about the problems of maintaining a system for the benefit of all.

The project, which is really an innovative computing facility, chose the RSTS-11 because it is a system that the students could handle. They did not initially need a wealth of knowledge about computers. They can produce while learning. With disk, DECtape, card reader and line printer, students can learn to use storage and manipulate files creatively. An Opscan-17 directly interfaced to the RSTS-11 gives them the capability to explore data collection problems apart from card or teletype data input.

The student staff and student users communicate freely and with empathy. Each encourages the other to try new applications, new techniques, to identify software changes and designs for hardware modification. The remote user is as much a part of the central facility as the student who is physically present at the site.

Project DELTA is making computer learning fun. The students are writing and using programs in all subject areas. Teachers are being caught up in the enthusiasm of the students. It is the student participation and sense of ownership that makes the project work. Such success has broadened the base of users so that an additional RSTS system based on the PDP 11/45 is being purchased for summer delivery and the user library is growing daily.

Submitted by:
Dr. D. M. Robinson and
Mrs. T. O. Green
Project DELTA
University of Delaware
Newark, Delaware



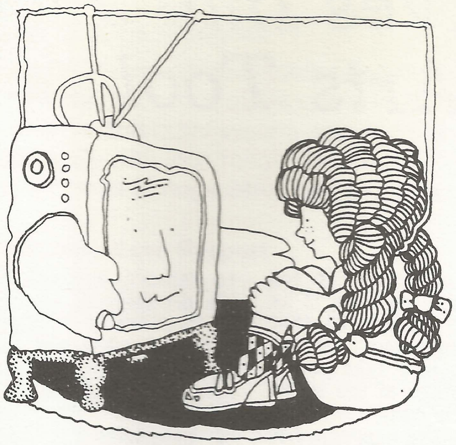
BOY COUNTS 88 AND WINS COMPUTER

David Rosenfeld, a 12-year-old boy from Berkely Heights, New Jersey, joined the computer generation when he counted 88 eights in the "Count The Eights" contest poster. David entered the contest that was open to every school student in the country.

As the winner of the contest, the school of David's choice, Governor Livingston High School, received a DIGITAL EduSystem 5, consisting of a PDP-8/F computer with 4K words of memory, console terminal, education software package and training.

Because he is now finishing his last year in Junior High School, David, made the decision to present the computer to the high school where he will have the full benefit of working and studying with the computer for the next three years.

Formal presentation ceremonies took place at Governor Livingston High School, Watchung Boulevard, Berkely Heights, New Jersey, on February 27, at 9:30 a.m.



TV DOCUMENTARIES

The Massachusetts Institute of Technology and ABC News are collaborating on the production of a series of television documentaries dealing with the effects of science and technology on our daily lives, it was announced by M.I.T. President Jerome B. Wiesner and Elmer W. Lower, President of ABC News.

The series of 30-minute, color filmed documentaries titled "What About Tomorrow?" premiered on Monday, January 22. At least five additional "What About Tomorrow?" documentaries are planned.

"We welcome the opportunity to participate in this series," Dr. Wiesner said. "Television is an extraordinarily important medium of public information and our hope is that this project will help the public understand more clearly the critical role of science and technology in human affairs."

Dr. Wiesner was Special Assistant for Science and Technology to the late Presidents John F. Kennedy and Lyndon B. Johnson.

Mr. Lower said, "Never before has the scientific community believed more strongly that science and technology must be concerned directly with the needs of mankind—that the scientist and the technologist must attempt to mediate between man and his environment on the side of man. These programs will give some indication of how that mediation process is being conducted."

M.I.T. Provost Walter A. Rosenblith, who is overseeing MIT's participation in the series said that while most of the filming will be done on MIT's campus in Cambridge, the series is not about MIT but will deal with man's relationship to science and technology and the vast capacity sciences and technology have to change his world. "A deeper understanding of science and technology today is necessary if we are to solve the problems that an improvident use of science and technology create," Professor Rosenblith said.

The series will show professors and students, primarily MIT, seeking new applications of science and technology to the problems that beset mankind. A variety of scientific work-in-progress will be examined in the programs ranging from basic physical phenomena to the future of our cities; from fundamental life processes to communications and human learning; and from the latest biomedical engineering to the assessment of the consequences of introducing new technologies.

The ABC News "What About Tomorrow?" series is recommended for viewing by the National Education Association.

JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS

Designed to inform educators who are interested in making optimum use of technology, this *Journal* deals with systems in which technology and education interface. Special emphasis is given to papers that deal with matching technological instruments and tools to the learning process and the human user.

The *Journal of Educational Technology Systems* also deals with the nature of technological devices (hardware) that are useful for teaching and learning. More importantly, it focuses on the techniques and approaches (software) for using technology in all types of educational systems. Description of actual classroom practice and experimentation with educational use of technology is still another important aspect of the *Journal.* Finally, it features innovative papers dealing with systems for making use of technology to individualize instruction.

The first issue had a feature article on Digital Simulation in Education by Dr. Ludwig Braun discussing the rationale and actual experience of the HUNTINGTON TWO Computer Project. (A description of simulation materials available from this project along with a sample unit on Pollution called POLUT is available free from the Education Products Group, DIGITAL).

The Journal Presents:

- articles on classroom use of new modes of technology
- experimental programs now being tested in schools throughout the world
- programs involving computer assisted instruction, and their software
- unique applications of instrumentation in the classroom
- instrumented programs for the handicapped
- use of systems approach for design of instructional models
- interplay of computers, educational TV, filmstrips, slides, and related media instruction
- manifold utilizing information retrieval systems
- programs in adult and continuing education

Not an inexpensive journal, subscriptions cost $25 per year of four issues. Why not write first and ask for a sample review copy (try to get Vol. 1, No. 1).

Baywood Publishing Co., Inc.
1 Northwest Drive
Farmingdale, NY 11735

The Computer Evolves Into a Powerful Liberal Arts Tool

By JOHN G. KEMENY

Modern computers are only 25 years old, and yet computer science has become an important new profession. Someday there may be as many computer scientists in the United States as lawyers or doctors. Therefore, colleges and universities very early designed curriculums for the future computer scientist. But the wide use of computers in liberal arts courses is a recent development.

First came graduate programs to train computer scientists, and later a number of undergraduate major programs. The graduate programs deal with both hardware and software, while undergraduate programs are usually limited to software development. The word "hardware" refers to the collection of electronic gear that makes up a modern computation center. This collection of equipment has very limited usefulness as it leaves the factory. However, it has an almost unlimited potential for learning.

Computers are taught how to solve a variety of problems by means of a series of "programs." These range from simple recipes for solving elementary problems to a description of how a computer can simultaneously handle a hundred or more users in a time-sharing system—a program of several hundred thousand instructions. The collection of all the programs within a computing system is referred to as "software."

It was natural for departments and schools of engineering to take the responsibility for the teaching of computer hardware. Software is a new kind of subject matter for academic institutions. Programing a computer is more of an art than a science, but it has a strong mathematical flavor. Therefore it is very common for departments of mathematics (or of applied mathematics) to take responsibility for the teaching of software. This makes computer science an interdisciplinary program and institutions thus come up against all the problems associated with the launching of a new program that does not fit within a single department.

Departmental prerogatives are very strong on all campuses and are jealously guarded. Some institutions have solved this problem by having either the mathematics or engineering department take full responsibility for the training of computer scientists, while in other institutions new departments of computer science were created.

Perhaps the best way to give the layman a flavor of computer science curriculums is to describe the problem of writing a "compiler." Computers are built with an internal electronic code that can be activated by a complicated set of symbols based on a number system to the base 2 (the binary number system). It is a most unnatural language for human beings to speak. One of the major breakthroughs in the history of computers was the idea of teaching the computer a language more natural for human beings. Many such languages are now in common use, including FORTRAN, BASIC and ALGOL.

Elaborate Program

But how does one teach a computer a new language? Someone must write a very elaborate program that will explain in complete detail to the computer how it is to interpret an instruction in, let us say, BASIC. A statement such as

```
LET X=5
```

is very simple for a human being to understand. It is meaningless to a computer. The programer who is teaching BASIC to the computer has to give complete instructions on how that statement is translated into the complicated internal binary code of the computer. He must make sure that all legal options in the language are understood by the computer but that the computer recognizes illegal statements.

At the same time, it is the task of the programer to see that the resulting code is as efficient as possible so that when the program is actually executed it will take maximum advantage of the speed of a modern computer. Furthermore, the programer must always keep in mind that computers have no common sense and hence require an incredible amount of detail.

Such an elaborate program, designed to teach a new language to the computer, is known as a "compiler." Many campuses have engaged in extensive debate as to whether teaching the art of compiler-writing is a legitimate subject-matter for a liberal arts institution. Some have answered this in the affirmative and some in the negative, and such courses are a standard feature of graduate programs for computer scientists.

Programs for computer scientists have an effect on relatively few students. However, in recent years computers have led to vast curricular changes in courses that used to have no connection to computers. At Dartmouth College each year, 90 per cent of the freshman class learns how to use a computer. This makes it possible for many faculty members to assume that the students in their course will be able to carry out assignments on computers.

In science and engineering courses the computer has become a powerful replacement for the traditional slide rule. Newton's Law can be illustrated equally well in terms of dropping a weight from the Leaning Tower of Pisa or in terms of a rocket trip to the moon. The principles are similar, but the computations in the latter case are vastly more complex. The easy availability of computers has made it possible to assign rocket trips to the moon as standard freshman exercises, thus adding a new dimension of realism, not to mention greater interest, to the physics course.

Drudgery Removed

In effect, computers serve to remove a great deal of the drudgery of introductory science and engineering courses and allow the student and the professor to concentrate more of their effort on the teaching of principles. It has also brought to the undergraduate student the kind of research power that has until recently been limited to highly sophisticated research groups.

But the curricular impact has by no means been limited to science courses. At Dartmouth, it appears that the heaviest users of the computation center will turn out to be the social scientists. Many social science courses deal with hypotheses formulated from vast amounts of data. The analysis of millions of pieces of information has normally been left to a small group of experts, and the student was forced to accept theories on the basis of evidence that he had never had an opportunity to examine. In effect, the computer has created a new laboratory for the social sciences.

At Dartmouth, in social science courses (including freshman courses) it is now possible for students to work with the original data, to formulate their own hypothesis, and to carry out sophisticated statistical tests to check the hypotheses. Statistics used to be the most hated part of the social science curriculum, not because the principles are difficult or uninteresting, but because statistics involved a student in long hours of dreary computations. Once one concedes that there is nothing uplifting to the human soul in having to compute the mean and standard deviation of a set of a thousand numbers, one cheerfully relegates this task to the computer.

This has led to a new academic controversy, namely, whether students who have computers at their fingertips are less likely to understand basic principles. It has been my experience that exactly the opposite happens. In giving exercises to students to illustrate complicated principles, forcing students to go through lengthy and unpleasant arithmetical operations can prevent understanding. The student may spend more time on checking his arithmetic, or trying to remember how to take a square root, than in paying attention to the principles involved.

If instead the student is forced to write a computer program, that is, to explain to the computer how the problem must be solved—he will significantly improve his understanding. It is an old joke in academic circles that the best way to learn a subject matter is to teach it. Students who teach computers how to solve problems learn an immense amount in the process.

Less of a Stranger

Students find it as natural to turn to the computer for help as to go to the library for ideas and for sources of information. One notices faculty members and students walking on campus with a stack of books under one arm and a computer printout under the other. Students can become much more actively involved in courses in which they were formerly passive. And this stage, which is transitional in nature, may prepare students for their adult life at a time in the future when all of us will take for granted having a computer terminal in our home.

Dr. Kemeny is the president of Dartmouth College.

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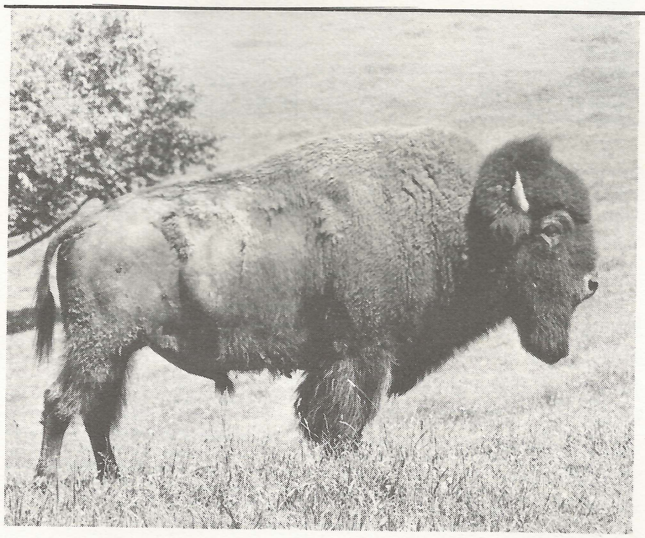
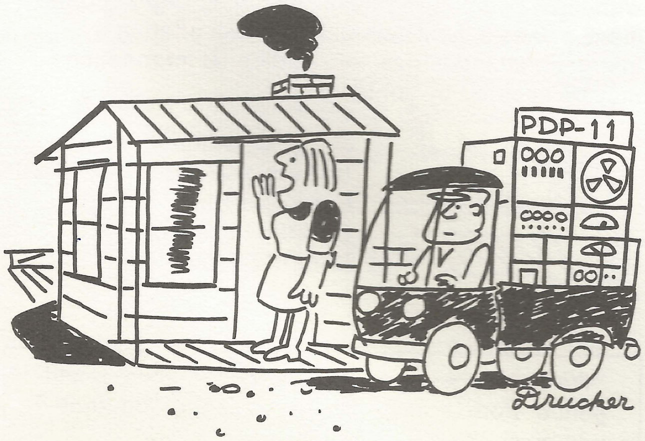


Effective management of endangered animal species can be best studied using a computer simulation in which students can control the many interacting variables.

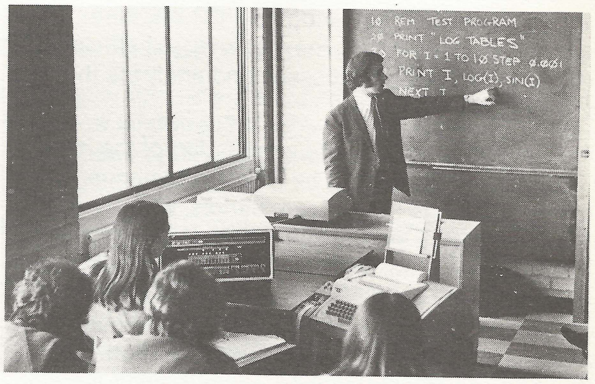


"Charlie! Where do you want the computer?"

BLACKPOOL GRAMMAR— FIRST WITH DIGITAL EQUIPMENT MINICOMPUTER

The first Digital Equipment computer to be installed in a U.K. Grammar School started operation in September 1971 at The Blackpool Collegiate Grammar School with 1,650 co-educational pupils from 11 to 18 years of age.

Instruction for the "A" Level course in "Computer Science," popular with students of the School's 6th Form, uses a Digital Equipment PDP-8/E computer, purchased on the advice of the National Computing Centre, Manchester. Courses are conducted by Mr. Graham Batty a graduate in Computer Science, with a wide experience of use of DIGITAL minicomputers.



```
10 REM TEST PROGRAM
   PRINT "LOG TABLES"
   FOR I = 1 TO 10 STEP 0.001
   PRINT I, LOG(I), SIN(I)
   NEXT I
```

Initially 16- to 18-year olds, mostly mathematicians, are using the system, but eventually the School would like its use to be spread through all the disciplines—particularly to Science and Economics, and to the lower age groups. Already lessons in "Computer Appreciation" form part of the general studies course; and the Economics students, planning a survey of politics within the school, are currently designing a questionnaire suitable for computer analysis.

In commenting upon the School's reasons for purchasing a PDP-8/E, Mr. E. Makin, Head of the combined Mathematics and Computing Departments said, "There was nothing else of the PDP-8/E's capacity in the price bracket." He added, "One aspect we liked particularly about the PDP-8/E was its expandability. We are anticipating an explosion of interest in this subject, and the system chosen had to be capable of expansion to cope with this demand, as and when necessary."

Mr. Makin continued, "We are particularly grateful to the National Computing Centre for their most valuable advice and guidance concerning the choice of a computer. We were fortunate in the appointment of Mr. Batty, whose expertise and enthusiasm have made it possible to make such an immediate start to the "A" Level Course.

"We have also been very impressed with Digital. The literature they have been able to supply, particularly their famous handbooks, are extremely useful as teaching aids, and their back-up could not have been better."

THE MINICOMPUTER & STUDENT RESPONSE

What's new about student response? Well, there is not much new about student response, but here is a lot new about what some people are doing with it.

Recent innovations in technology and computerization have opened up new avenues of endeavor within many educational environments across the country.

Take for instance the recent Instructional Industries, Inc. Student Response System installation at the University of Southern California School of Medicine at Los Angeles. This system allows 264 individual students, by use of special pushbutton stations, to participate and respond to questions in a large classroom environment. An electronic scanning unit then collects these responses and sends them off to a Digital Equipment Corporation 4K PDP-8/E minicomputer. This very small, inexpensive, yet efficient computer system then processes and analyzes this data, in a real-time mode.

Another effective and unique application of the mini and Student Response can be found at Malcolm X Community College in Chicago, Illinois, where an 8K PDP-8/M is used to service two 108 seat Student Response classrooms. In this installation, each classroom is equipped with its own instructor's console and teletypewriter. Using a priority interrupt and pushdown stack technique within the software, both classrooms receive analysis, printed on their own teletypes, "instantaneously" upon recording the students' responses. The software program, developed for Malcolm X by Instructional Industries, Inc., also assigns student names to seats by a special paper-tape roster, read in during the initialization procedure.

The immediate feedback the instructor receives during his presentation includes visual indication of the overall group performance, plus hard copy printout on a teletypewriter of both detailed item analysis and individual student performance, coming directly from the PDP-8 minicomputer. This type of data gathering and analysis for so many students, through such efficient use of the mini—serving many students through one inexpensive computer system—has provided one of the most cost effective applications of the PDP-8 series.

The student response concept of student participation, reinforcement, immediate feedback to the instructor, and then an evaluation process, has represented a marked advantage over the traditional method of assessing student comprehension. It is most important that the instructor rapidly assess student understanding of materials presented, and immediately identify the areas that need reinforcement. Quoted by Dr. Manning, Associate Dean, Postgraduate Division, University of Southern California School of Medicine, "The new system will allow the faculty to organize problem solving sessions with active participation in large groups. These activities have previously been restricted to small groups."

Shown here is Dr. Manning, Associate Dean, Postgraduate Division, School of Medicine, reviewing mini-computer analysis from 264 students during a recent lecture at the University of Southern California at Los Angeles.

Instructional Industries, Inc., an independent affiliate of General Electric Company, historically is an outgrowth of the educational systems group in General Electric's Corporate Research and Development Center. Their response systems offer exclusive expansion features for the addition of student stations, a second classroom, or individual carrels, at some later date, without duplicating the basic electronic equipment, thus holding down the cost of this expansion.

The capability of servicing multiple classrooms and independent study carrels, simultaneously, is a feature unique in the field. Software support and compatibility with most computer systems, including Digital Equipment, makes a most complete product offering by Instructional Industries, Inc. Additional information may be secured by contacting:

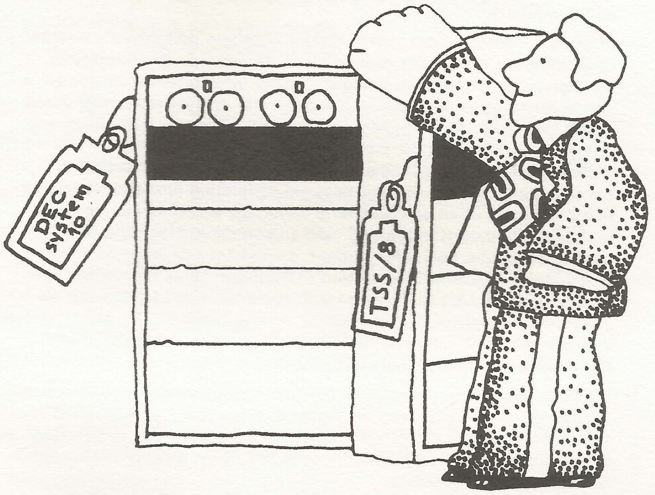
Mr. John Wilfore
Instructional Industries, Inc.
Executive Park
Ballston Lake, NY 12019
(518) 877-7466

> "We have a tendency to divorce technical intelligence from human life—you cannot do that—you must use that knowledge."
>
> *Father J. Donald Monan*
> *President of Boston College*

TRADE IN YOUR RSTS-11 OR TSS/8 ON A DECSYSTEM-10

In an effort to provide expansion capability to many DEC Educational Customers, an upgrade plan from Timeshared-8 Systems (also known as TSS-8 or EduSystem 50) and RSTS-11 systems to DECsystem-10 is available. The following presents preliminary guidelines regarding this plan:

- A credit of up to 20 percent of the DECsystem-10 list price may be granted on TSS-8 and RSTS-11 trade-ins. This, of course, is limited to a maximum of 100 percent full equity credit on the 8 or 11.
- Quotations including trade-in provisions must include the following constraints:
    1. Purchase order must be received by June 30, 1973 with
    2. Delivery of DECsystem-10 specified by December 29, 1973.
- To obtain a specific trade-in price, contact your local DIGITAL salesman.



PROGRAM OF THE MONTH

This program is a good example of how BASIC-PLUS can be used to write a batch driver for RSTS-11. Note that it requires operator intervention if there is a job or data error. The system on which the program was developed has 28K of core, a mark-sense card reader, two DECtapes, and an 80-column line printer.

Submitted by: Yoach Gilat
Center for Educational Technology
8 Yaacon Street
Herzlia, Israel

```
LIST
CR       02:05 PM           09-APR-73
01  ! CARD RUNNING PROGRAM - MARDIKS CHAIM  2-OCT-72
02  ! IF THERE ARE DIAGNOSTICS, USE COMMAND RUN CR
03  ! IF DATA ERROR ON DEVICE, USE COMMAND CHAIN "CR" 30
05  PRINT FOR I%=1% TO 10%
06  PRINT "-"; FOR I%=1% TO 72% : PRINT
10  PRINT FOR I%=1% TO 10%
30  OPEN "FILE.BAS" FOR OUTPUT AS FILE 1%
40  PRINT #1%," 1 PRINT 'PROGRAM RUN FOLLOWS:' : PRINT "
50  PRINT #1%," 2 ON ERROR GOTO 9998"
60  PRINT #1%," 9998 CHAIN 'CR.BAS'"
100 OPEN "CR:" AS FILE 2%
110 INPUT LINE #2%, X$
120 X$=LEFT(X$,INSTR(1%,X$,CHR$(10%))-1%)
130 IF LEFT(X$,4%)="####" THEN 1000
140 IF LEFT(X$,4%)="    " THEN 160
150 PRINT #1%, X$
160 PRINT X$ : GOTO 110
1000 CLOSE 1% : PRINT
1100 PRINT "DIAGNOSTICS FOLLOW:" : PRINT
1200 CHAIN "FILE.BAS"
10000 END

READY
```

NEW PRODUCTS FROM THE INDUSTRY

VIDEO PROJECTOR—VIOR Company—has announced the Model 10 monochrome video projector.

The Model 10 is a low cost, high quality, single integrated unit. It projects a clear, bright television picture on screens from three to twenty-four feet wide using either front or real screen projection. The Model 10 interfaces with any video source, including computer driven video generators. The unit features solid state technology throughout. A green projection kinescope, for greater visibility of alphanumeric and graphic data is available for computer output applications. The VIOR Model 10 is available at a list price of $3,950.00.

VIOR Corporation designs, manufactures and markets, wide screen video projector systems for business, industry and government. VIOR Corporation is located at 114 Pleasant Avenue, Upper Saddle River, New Jersey 07458.

INTERACTIVE TERMINAL—Digi-Log Systems, Inc.—has introduced the Model 33 Interactive portable data terminal to be used with standard television sets.

It is a light-weight desk top CRT designed to be fully interchangeable with Model 33 Teletypes. No software modifications are ever required. The Model 33 contains:

- Alphanumeric display driver, 80 characters per line by 16 lines
- Teletype format keyboard
- MOS memory
- All control logic
- Teletype or RS232 Interface
- Selectable speeds of 110 and 300 baud
- Selectable half or full duplex operation
- Selectable scrolling or page modes
- Optional built-in acoustic coupler
- Provisions for interfacing hard copy devices and magnetic tape cassettes

The basic unit is $1,395.00 with options priced at $120.00-$240.00. Their address is 666 Davisville Road, Willow Grove, PA 19090.

CAI GOES TO MEDICAL SCHOOL

(DESIGN CONSIDERATIONS IN DEVELOPMENT OF MINICOMPUTER-BASED COMPUTER AIDED INSTRUCTIONAL HARDWARE SYSTEMS)

C. H. Wells, Ph.D.
Department of Physiology
University of Texas Medical Branch
Galveston, Texas 77550

Abstract

Computer Aided Instruction (CAI) has proven to be an effective educational technique for Socratic, drill, problem solving, or patient management programs. However, both excessive hardware costs and inordinate time requirements for preparation of each hour of instructional material have contributed to its slow development as an everyday tool. In an attempt to minimize these difficulties, the design of a minicomputer-based CAI System, the development of a prototype system and the preparation of an author-oriented language were undertaken. This system has now been tested by medical students, interns and residents on problem solving, tutorial and patient management simulation programs.

The system has been well received by the student population, has proven educationally effective with those programs for which such data are available, and has very significantly reduced both program preparation time and hardware costs.

The performance requirements used in designing this system will be discussed, as will the design used to meet these requirements.

* * *

The educational value of Computer Aided Instruction (CAI) is adequately documented,[1,2] yet its use remains quite limited. There are unquestionably a number of factors that contribute to its poor acceptance as a day-to-day teaching tool. Of these the high hardware cost and inordinate amount of faculty time needed for program preparation appear to be the most important. In an attempt to retain the program flexibility and interactive abilities of traditional CAI systems, while substantially reducing program preparation time and hardware costs, a prototype version of a minicomputer-based CAI system was constructed at the University of Texas Medical Branch and a CAI language developed for use with this system. This report describes the considerations we found to be necessary in design of a functional minicomputer-based CAI system.

Computer aided instruction can be a highly interactive and evaluative tool and its potential can only be realized when these assets are effectively utilized. There is little to warrant its use as a text book or lecture substitute. Its interactive abilities make it suitable for a number of educational needs that have previously required extensive one-to-one student to faculty interaction. The teaching of problem solving techniques or use of patient management simulations are not amenable to group teaching and consequently receive little or no emphasis despite the obvious need to improve decision making skills. The following are the first few frames from a CAI program used to help students develop the ability to handle renal clearance problems.

Computer: Suppose you ran renal clearance studies on a patient and obtained the following data.
Urine flow rate: 2cc/minute

	Glucose	*Inulin*	*Osmolarity*	*PAH*
Urine	400 mg%	0.6 mg/cc	765 mOs/kg	3.2 mg/cc
Plasma	290 mg%	0.01 mg/cc	293 mOs/kg	0.015mg/cc

Can you calculate his T_m for glucose?

Student: No

Computer: O.K., let's be sure you know what a T_m is. The T_m for glucose is the maximal rate at which glucose can be ______________ by the tubular cells.

Student: Juggled

Computer: Sorry, that answer doesn't make any sense to me. Take another look at the statement and rephrase your answer.
The T_m for glucose is the maximal rate at which glucose can be ______________ by the tubular cells.

Student: Reabsorbed

Computer: Good. We want to know the maximal rate of glucose reabsorption. There doesn't appear to be a direct way of doing this; however, this value should be the difference between the rate of glucose filtration and the rate of glucose excretion. Take another look at the data and calculate the glucose excretion rate.

Urine flow rate: 2 cc/min

	Glucose	*Inulin*	*Osmolarity*	*PAH*
Urine	400 mg%	0.6 mg/cc	765 mOs/kg	3.2 mg/cc
Plasma	290 mg%	0.01 mg/cc	293 mOs/kg	0.015 mg/cc

This individual's glucose excretion rate was______________?

Student: 8 mg/min

Computer: Right!
Now, what was . . .

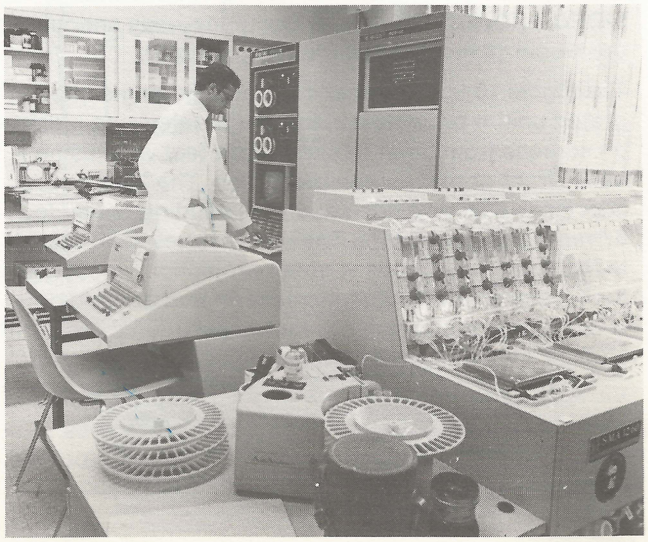
Programs of this type consist of two parts: (1) the logic instructions that allow the machine to execute the educational strategies of the instructor according to his predetermined criteria and (2) the textual content of the program. The ability to store and execute the control logic for such a program requires little logic storage capability and its execution requires very little computer time. It is well within the capabilities of the currently available 12 or 16 bit general purpose minicomputers.

In order to demonstrate that hardware cost and program preparation time could be drastically reduced with an appropriately designed minicomputer CAI system using a flexible, user-oriented language, a single terminal prototype minicomputer CAI system was constructed at the University of Texas Medical Branch. Although the system was designed with video disc storage in mind, the prototype was limited to a single terminal using a Kodak RA 960 random access projector for storage of course content because of funding limitations. The terminal consists of an alphanumeric keyboard and a screen on which course content is displayed by rear screen projection. The projector is controlled by the computer through an interface of local design. An 8K Digital Equipment Corporation PDP/8E serves as the central processor, and an ASR 33 Teletype with paper tape reader is used for program preparation. This prototype system has been in operation since January 1972 and has been tested with Drill, Problem Solving and Patient Management Simulation programs.

We have found that reasonably complex, educationally effective programs can be readily handled by the system, that it is well liked by the students and that through use of CAIBO, a CAI language written for this system, faculty can and will write their own programs after a brief period of instruction.

The economics of minicomputer-based CAI are also encouraging, especially when compared with traditional systems based on medium or large processors such as IBM's 360/40. A 10 terminal version of this system could be constructed for less than $40,000.

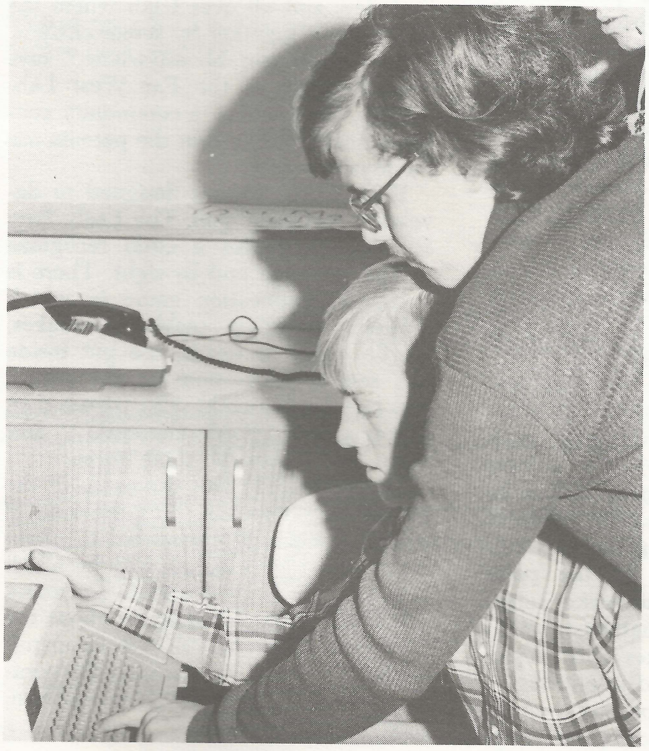
This study was supported in part by National Fund for Medical Education Grant 95169.



COMPUTER EDUCATION AT BUTLER HIGH SCHOOL

In the fall of 1970 Butler Area Senior High School started an experimental program in computer science education. A terminal was made available to any student with free time to use and learn the BASIC computer language on a self-study basis. No formal instruction was provided, yet surprising stimulus was demonstrated by the students and amazing programs resulted.

By the end of the year students were writing programs to do their homework, process their science labs, and experiment with data processing problems. A program entitled ATTEND was written by a self-taught student and now appears on three national public libraries. This program categorizes by class, alphabetizes, lists, and give percentage of daily attendance. A program entitled SENRAN was also written by this student to rank seniors by their quality point averages. This program saved administrative secretaries weeks of work. SENRAN was also placed on a national system and used by several schools.



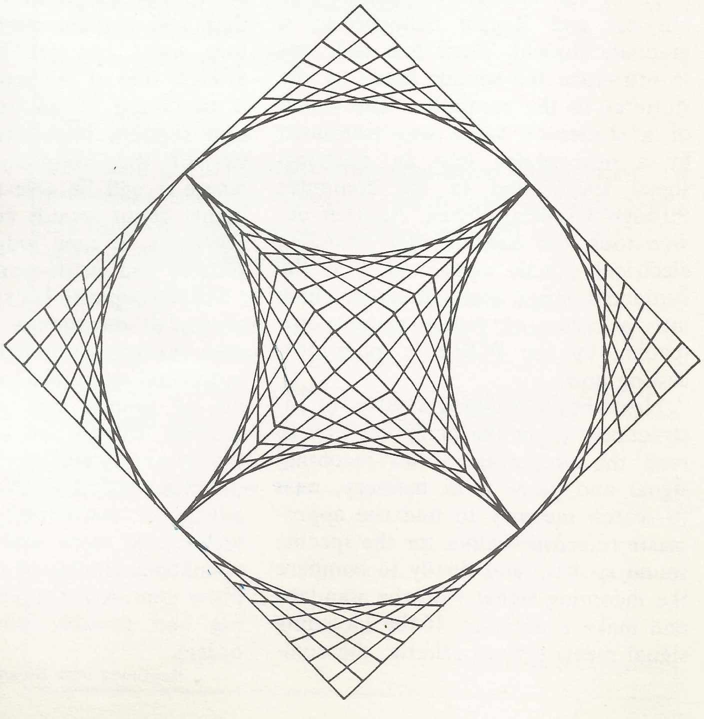
In the second year a computer science course entitled COMPUTER TOPICS—BASIC was written to provide organized study for the students. COMPUTER TOPICS—BASIC was found to work into a 12-week time allotment very successfully. It provided a moving class with one 45-minute period per day, and covered all the fundamental material including files and string variables.

In the summer of 1972, six Butler faculty members participated in a National Science Foundation Cooperative College-Secondary School project at Slippery Rock State College. This program gave fifteen area school districts the opportunity for faculty training in physics, biology, chemistry, mathematics, and social science. The program has an academic year phase included in it which is operating through the 1972-1973 school year. A users group was formed from the summer session and affiliated itself with COE—Computer Oriented Educators—a Pittsburgh-based users group. As a result of these groups, schools in the entire Southwestern Pennsylvania area have a firm foundation in computer education.

With only one terminal available and various uses being realized by 1972, it was necessary to purchase a system. Up to this point the school had spent nearly $9,000 per year with only receipts to show for it and a limited number of students getting experience. Approximately eight months went by before an EduSystem 50 was selected. With the high interest in computer education the number of student users per week rose abruptly to above 300. The new system contains the following:

System Designation—EduSystem 50 (TSS/8)
  PDP-8/E Computer
  20K Core Memory
  Dual DECtape
  Mark Sense Card Reader
  Magnetic Disk
  4 Local Teletypes
  2 Remote Teletypes
Languages Used Most:
  BASIC
  FORTRAN
  ASSEMBLER

Submitted by: Mr. William Ellis, Computer Supervisor
Butler Area Senior High School
Butler, Pennsylvania



Computer Assists Stuttering Therapy

Dr. Ronald L. Webster, associate professor of psychology at Hollins College in Roanoke, Va., is using a PDP-81 in the treatment of stuttering.

The minicomputer is being used in the college's Fluency Shaping Program, which provides a treatment procedure for stuttering based on the observation that the specific, observable speech behaviors of stutterers can be reconstructed to yield from markedly improved to normal, fluent speech. Dr. Webster views stuttering as a behavioral problem, not as a component of an underlying emotional disorder. Careful, intensive, systematic retraining in how the stutterer makes the sounds, syllables, words, and sentences of his language forms the basis for the program, he explains.

Using earphones and a tiny mike, a stutterer talks to the computer, and it replies via the typewriter.

Dr. Webster developed the computer-assisted fluency shaping program in collaboration with professor Keith Hege of the college's department of physics, and Reggie Schoonover, a graduate student. Their first task was to introduce the sounds made by the stutterer to the computer. The sound of a stutterer's voice was translated by a microphone into an electrical signal transmitted to the computer through a special circuit. Another device took the continuously changing electrical signals associated with the stutterer's voice and converted them into a series of pulses suitable for reading by the PDP-81's main processing unit.

Next they developed a series of instructions to get the computer first to read the properties of an incoming signal and place it in memory, next to search memory to find the appropriate reference values for the specific sound spoken, and finally to compare the incoming signal with the standard and make a decision. If the incoming signal meets certain criteria, the computer will signal the subject that the speech sound has been made properly.

The better judge

The subject sits at a typewriter terminal wearing a headset microphone. He talks into the microphone and gets back via typewriter such responses as: That was an awful sound, you dummy; Whoops; very good response; that was a very good sound, Charlie; Bad, Bad, Bad !!!!!; and try that one more time. Dr. Webster says stutterers in the program have really liked working with the computer. "They feel the computer is consistent and fair in its judgements about the adequacy of their speech responses. Previously we had been asking human therapists to make decisions about rather minute characteristics of behavior. It was no surprise to find that the computer was a more reliable judge."

One of the more meaningful results of using the computer, he said, was that stutterers learned more quickly the specific movement patterns involved in producing speech sounds. "We decided this was because removing the human reduced disruptions and allowed the subject to concentrate on learning the speech task."

At present the computer is working solely as a judge of speech sound accuracy. The stutterer works through a programmed text while the computer listens, tells him whether or not he is correct, and signals when to go on to the next step.

Performance goals next

The Hollins group's next step will be to develop a computer program that will contain performance goals that must be met by the subject at each step of the program before he is permitted to go on. Dr. Webster also foresees improving the capabilities of the computer to the point where it will be able to make judgements about sounds contained within sentences. It now judges only single-syllable and single-word utterances.

The group also is exploring the possibility of having the computer diagnose the speech sound deficiencies of individual stutterers to provide a profile of sounds that will require the greatest amount of attention during the retraining period.

Ultimately, Dr. Webster sees the advent of "dial-a-therapy," where subjects could work with computers via telephones connected to regional computer centers for treatment of stuttering and possibly other speech disorders.

Reprinted from *Datamation*, Feb. 1973.

Toy Lending Library

Child's play is serious business. That's the basic assumption of the Toy Lending Library, invented and field-tested by the Far West Laboratory for Educational Research and Development. The library's program, started in 1969, trains parents to use eight basic educational toys to help their preschool children learn fundamental concepts and problem-solving skills.

At the classes (generally one hour for each toy) parents learn to work with the toys and games and then borrow them to take home to use with their children. After completing the course, parents are free to borrow these toys just as they would borrow books from a library.

There are hundreds of Toy Lending Libraries across the country. A nun runs the library in St. Paul of the Apostle in New York City, a day-care worker runs one in Boston, a teacher's aide runs one in Chicago. There are libraries in twenty-six native villages in Alaska, in the Bank of America building in Berkeley, and all over Utah where the toys are put together by senior citizens. "The facility can be anywhere," says Fred Rosenau of the Far West Laboratory, "in a school, a community center, a health clinic—but the parents use the toys at home."

Each of the toys is designed to develop a particular skill. The Feely Bag, for example, helps a child recognize shapes by touch and by sight. There is a sound-identification game in which different materials, maybe cornflakes, maybe water or beads, are put inside two sets of cans—one for the parent and one for the child. The parent then shakes a can and asks the child to find a can that makes the same noise.

"Toys are only half the name of the game," says Rosenau. "It's the idea of getting the parent committed to working in a learning situation with his child. The toys are a good vehicle for doing just that." More information about the library can be obtained from its manufacturers, General Learning Corporation, 250 James Street, Morristown, New Jersey 07960. □

Reprinted from *Saturday Review EDUCATION.*

MAN—
THE ARCHITECT OF CIRCUMSTANCES

Instead of saying that man is the creature of circumstances, it would be nearer the mark to say that man is the architect of circumstances. It is character which builds an existence out of circumstance. Our strength is measured by our plastic power. From the same materials one man builds palaces, another hovels; one warehouses, another villas; bricks and mortar are mortar and bricks until the architect can make them something else.

—*Carlyle*

SOLID-STATE LOGIC COURSE

Digital Equipment Corporation invites you to find out through DEC's home-study course in solid-state logic. The mysteries of solid state (as used in DEC's K-Series modules) are unraveled in 18 comprehensive lessons that take you from basic numbering systems and logic principles through complex logic applications and even a system design problem.

Each lesson includes complete explanatory literature and a progress-measuring quiz. Complete the course at your own pace and really impress the guys down at the office.

LESSON 1—NUMBER SYSTEMS introduces decimal, octal, and binary number systems and conversions between systems; the binary system is emphasized because of its importance in digital control applications.

LESSON 2—AND & OR GATES covers the basic logic gates and their use, in combination, to achieve a desired function.

LESSON 3—INVERTERS discusses the negating logic function and illustrates the transformation of AND gates into OR gates and vice versa.

LESSON 4—NOR GATES introduces another logic function and discusses its application in circuits.

LESSON 5—NAND GATES describes yet another basic logic function, its use in building OR and AND gates, and its application.

LESSON 6—DIGITAL ARITHMETIC (I) covers six rules of digital-systems arithmetic, the rules being based upon the operation of AND and OR gates.

LESSON 7—DIGITAL ARITHMETIC (II) adds three more rules of digital arithmetic and discusses their usefulness in the simplification of complex circuits.

LESSON 8—DIGITAL ARITHMETIC (III) extends the rules of digital arithmetic to rule no. 10 and operations involving inverting gates.

LESSON 9—DIGITAL ARITHMETIC (IV) introduces the final rule of digital arithmetic, and applies all the rules to circuit simplification.

LESSON 10—COMPOUND GATES (I) looks at AND/NOR gates, Exclusive OR gates, and comparator gates; the rules of digital arithmetic are used to demonstrate the operation of these circuits.

LESSON 11—COMPOUND GATES (II) furthers the discussion of compound gates: Exclusive OR's, comparators, and equality detectors.

LESSON 12—FLIP-FLOPS (I) introduces a new logic element and discusses its operation.

LESSON 13—FLIP-FLOPS (II) investigates the flip-flop as a memory device and discusses its application to digital storage and BCD coding.

LESSON 14—FLIP-FLOPS (III) considers the conversion of decimal numbers to binary numbers and the storage of the output of binary encoders.

LESSON 15—COUNTERS looks at the use of another logic element, the Binary, for counting.

LESSON 16—FLIP-FLOPS (IV) introduces the D-type and J-K flip-flops and covers their use as counters and shift registers.

LESSON 17—LOGIC APPLICATIONS discusses the problems encountered in practical digital logic systems.

LESSON 18—SYSTEM DESIGN PROBLEM provides a test of the knowledge gained in the previous lessons.

The complete 18-lesson course is just $5, plus $20 per instructor's guide (including answer book).

Yes—I've always wanted to know all about solid-state logic. Please send me ________ sets of DEC's solid-state logic course and __________ instructor's guides, for which $________________ is enclosed as payment in full.

Name____

Position____

Company____

Telephone No. and Extension______________________________

Address____

City______________________ State______________ Zip____________

Send to: Pat Lacombe (5-2)
Digital Equipment Corp.
Maynard, MA 01754

DEC Revamps Education Group; Beefs Up Staff

MAYNARD, Mass. — Digital Equipment Corp. has broken its Education Products group into specialized areas, naming six new marketing managers and one technical support specialist.

The seven staff additions include Rick Faubert, former DEC branch sales manager in Ann Arbor, Mich., named senior marketing manager for marketing sales training and sales force liaison. Robert Meese, a former National Science Foundation Undergraduate Fellow in psychology, was named marketing manager for college computer sciences.

Charles Mead, previously a computer simulations designer for Continental Can Co., has been assigned responsibility for dedicated computer applications in college laboratories; Sally Bower, former district training coordinator for RCA's Computer division, was named marketing manager for secondary school instructional applications in math, science, business, social studies and computer science.

Alice Peters, previously a system engineer and author of student scheduling software for IBM, was named marketing manager for secondary school computer administrative applications; Alan Mowbray, former central region sales manager for Digiac Corp., has been named marketing manager for computer applications in vocational/technical institutes, community and junior colleges.

Mary Cole, a former technical writer at DEC, was named technical support specialist in new software development and software support for education products.

David Ahl, education group manager, said marketing was expanded because computer sales for the group have been doubled for each of the last 3 years, and were expected to do so again in 1973.

He noted that the group introduced eight new computer systems for education last year and has under development a broader range of curriculum materials to aid teachers and students in a variety of subject areas.

Jeff Strohm, a student in the computer programming course at BHS is pictured thread- ing a prograr ed by the scl

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Data Processing Course At BHS Proves Popular With Students

BY MARI ZWIRGZDAS

Data processing began at Burlington High School in September of 1967 when 25 students in the math club decided they would like

and McDonough began teaching the Fortran language to 25 students two evenings a week. The punched computer

approved the purchase of a high-speed reader and ter om in 's e

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ROCHESTER DEMOCRAT AND CHRONICLE Sunday, Nov. 26, 1972

$100,000 Homework Aid

By KATHY O'TOOLE

A machine that lurks in an out-of-the-way corner of Edison Technical and Industrial High School is doling out new homework to students throughout the building.

Students can't complain too ch, however, because the computer, in return, of their tradi- them.

Sunday, February 4, 1973

THE SAN DIEGO UNION

MACHINE PROVES FRIENDLY

Computer Game Allows Investor To Produce Profits And Losses

By HELEN CALL

There was a bus driver we heard about who got into short selling back in 1971. He used a computer to do his fig- and is supposed to have

The game began and it turned out to be a good simulation of a roaring bull market. But to begin with, I was cautious. I bought one share of IBM just to see what the machine would say.

It reported modest price across the

There was a dullness about prices at the close. The New York Stock Index gained just a shade. The computer reported me $3.70 ahead.

I followed a hunch and bought ABC. Prices fell. I sold. The NYSE Index dropped. My assets were mel- away.

Sudbury students use computers

By LORELEI SNYDER
Of The News Staff

SUDBURY — Five boys sit facing five keyboards in a small room off the Math Resource Center at Curtis Junior High School. They peck at certain keys, and then the machine takes over and types back at them. After 20 minutes or so these students leave and another oup takes over the hines.

se computer ter- the interest they students this they into

finding the answer. If the thinking is not in the right order, they get immediate feedback from the machine," she explained.

Eighth graders, who were allowed free use of the computers last year in their free time, will be given the same orientation as the seventh graders right after Christmas vacation.

Interest in the machines, for routine classroom work as well as exploring its other possibilities has developed to such a degree that sign up sheets are necessary, and if others are waiting a student may only use his terminal e-half a period.

his accounts for the e number of students are able to use them, as prevented the from becoming a " for those with a erest here. About t students will inals in a day. main assets of is that it 's there is. ay to sol this a over int science

also and se n

The professional games have an application beyond mathematics. "Civil War" is based on strategy, and one called "Hammurabi" allows the player to simulate a model environment and see the resu of certain choices based the laws of probability.

A computer club, u the sponsorship of tea William Morrison, learned to make repairs to the machi

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members paper is typed on on and was formerly Now the collect nd them, and s used before i ve found it a high ng tool," Mrs. Lil ed.

dents learn if you can to the computer ctly, it will give a onse. It will give back ou. just what you put into

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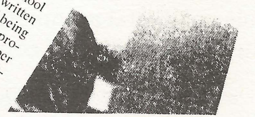
curriculum product review

If you weren't there for the development of the Hardy-Weinberg principle, of population genetics, you can simulate it with a Digital program. The company's project simulation kits in biology, earth science, physics and social studies, prepared by Huntington Two and the National Science Foundation, are geared to high school and college levels. All written in BASIC and capable of being run on any computer, the program kits each contain a paper tape of the program, background resource materials, student materials and workbook, and teacher commentary. Digital Equipment Corporatio



COMPUTER WEEKLY

Number 323 Thursday, January 11, 1973 Price 10p

Three new classroom compu ters have been added to th EduSystem range manufa tured by Digital Equipmen smallest, the EduSyste ed on DEC's PDP-8 with 4K mem typewri

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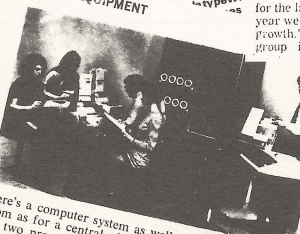
6 JACKSON DAILY NEWS Friday, July 28, 1972—A

SPECIAL COMPUTER COURSE — A specially designed computer course at Millsaps College for high school students investigates the relationship between mathematics and the computer. Dr. Robert Shive, left, shows st from left, Steve Laney, J Doug Leavanway, Jackson; and da Garmon, Clarksdale, the school's PDP-8/E computer.

OFFICE EQUIPMENT



Here's a computer system as well equipped for a classroom as for a central office. Biology and social studies are two programs available. Data processing packages include a new one for student scheduling. DIGITAL EQUIPMENT. AC Booth Q-62. Circle 301.

Digital Expands Education Group

Increased Market Activity, Record Sales Cited

MAYNARD, Mass. -- The Education Products Group of Digital Equipment Corporation has been expanded to include six new marketing managers and one technical support specialist, it was announced today. Digital is the world's largest producer of minicomputers used in education.

According to education group manager Dayid Ahl, "the expansion has been undertaken to meet the growing demand for computer systems from all segments of the education area. Computer sales for the group have been doubling each year for the last three years and this year we are projecting similiar growth." He added that the group introduced eight new computer systems for education last year and is currently developing a broader range of curriculum materials to aid teachers and students in more productive uses of computers for a greater variety of subject areas.

The seven staff additions will augment product and market planning, software development, communications and other administrative functions in support of Digital's' educational computer systems.

The new people are:

Rick Faubert -- formerly a branch sales manager for Digital in An Arbor -- named senior marketing manager for all aspects of marketing, sales training and sales force liaison.

Robert Meese -- a former National Science Foundation Undergraduate Fellow in psychology -- named marketing manager for college computer centers.

Charles Mead -- formerly a computer simulations designer for Continental Can Co. -- assigned responsibility for "dedicated" computer applications in college laboratories.

Sally Bower -- served RCA Computer Division as district training coordinator -- marketing manager responsible for secondary school instructional applications in math, science, business, social studies and computer science.

Alice Peters -- a former system engineer and author of student scheduling software for IBM -- marketing manager for secondary school computer administrative applications.

Alan Mowbray -- formerly central region sales manager for Digiac Corporation -- named marketing manager for computer applications in vocational/ technical institutes, as well as community and junior colleges.

Mary Cole -- a former technical writer at Digital who co-authored two 500 - page programming handbooks. -- named technical support specialist in new software development and software support for all education products.

As a poineer in the development of comupters for educational purposes, Digital has instalbed more than 4,500 computers in elementary schools, secondary schools and colleges around the world. "With our substantial staff expansion," says Ahl, "the Education Products Group is better prepared to take advantage of the current economic upswing, since our attratively priced small and medium-scale computers are particularly suited to the increasing instructional needs of secondary schools and the proliferating junior and community colleges."

Digital Equipment Corporation is the world's largest manufacturer of minicomputers. In addition, the companu is a major producer of small, medium and large-scale compter systems, peripheral equipment, interfacing devices, software packages and support services.

Headquartered in Maynard, Mass., Digital employs more than 10,100 people worldwide, and reported sales of $187.5 million in Fiscal 1972.

EDU SUBSCRIPTION RENEWAL FORM

This form must be returned to receive EDU in the 1973-74 school year. Please be sure to fill in *all* the information requested on *both* sides of the form.

WHAT DO YOU THINK OF EDU?

1. What articles do you like best in EDU?
   - ☐ Info on DIGITAL products (hardware, software)
   - ☐ Info on non-DIGITAL products
   - ☐ User Application Stories
   - ☐ Feature Articles
   - ☐ Classroom Ideas (computer-related)
   - ☐ Info and sources for new educational ideas (general)
   - ☐ History and Operation of DIGITAL
   - ☐ Conference and Convention Schedules
   - ☐ Problems and Games
   - ☐ Book Reviews
   - ☐ Other ____________________

2. Are you willing to contribute articles, ideas or stories to EDU?
   ☐ Yes ☐ No

3. Would you be willing to pay a small fee for EDU to defray printing and postage costs?
   ☐ $5.00/yr ☐ $2.00/year ☐ $1.00/yr ☐ None

4. What do you think of the format of EDU?
   ☐ Too Long ☐ Just Right ☐ Could be longer

5. How do you feel we could improve EDU? ____________________

QUALIFICATION INFORMATION

6. Current or planned computer usage
   - ☐ DIGITAL User—Model ____________________
   - ☐ Other User—Manufacturer and Model ____________________
   - ☐ Timesharing Service or RJE User
   - ☐ No Computer—Plan to get one
     When? ☐ Next 12 Mos. ☐ 1 to 2 years ☐ Longer
   - ☐ No Computer—No plans to get one

7. Type of Institution
   - ☐ Secondary School—Dept.? ☐ Math ☐ Science ☐ Other
   - ☐ Vocational/Technical School
   - ☐ Community or Junior College
   - ☐ College or University Computer Center
   - ☐ College or University Department
     Which Dept.? ____________________

8. Application Area(s) of Interest
   ☐ Instructional ☐ Administrative ☐ Research

9. Are you a member of DECUS EDUSIG?
   ☐ Yes ☐ No ☐ No, Please send an application blank.

BE SURE TO FILL IN NAME AND ADDRESS INFORMATION ON THE OTHER SIDE OF THIS FORM

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